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EDITORIAL.

Rice Cultivation In Italy.

A close study of the various factors affecting the rice-growing industry in Italy is of more than passing interest to Malaya. Not only is the production of rice of considerable importance in Italy, but the average yields are the second highest recorded in the world. Whereas in Malaya, the average yield of padi per acre is 0.52 ton, in Italy the average yield is 1.87 tons per acre. If it were possible to increase the Malayan yields to the Italian standard, this country would be self-supporting in the matter of rice production without any addition to the existing planted area. In 1931 when the price of rice was unusually low, the net imports of rice into Malaya were valued at $35,120,159, but the average annual value of net imports for the previous five years exceeded $60,000,000.

Dr. H. A. Tempany, Director of Agriculture, S.S. and F.M.S. visited the Italian rice areas in 1931, and his report on this subject is included in this number.

Those who are at all familiar with the methods of rice cultivation in Malaya will be able to compare the Italian methods with those obtaining in Malaya and are thus enabled to form some estimate of the extent to which the adoption of Italian methods are feasible in this country.

Conditions in the two countries are necessarily dissimilar in many respects, but it will become evident to the reader that the Italian system is based on a very much more intensive, and therefore more expensive, system of cultivation than that usual in Malaya.

Briefly stated, the Italians procure an average 1.87 tons of grain per acre at a cost of $170 (Straits currency) whereas in Malaya the yield is 0.52 tons at a cost of $35 per acre. The former country therefore produces its rice at a cost of about $90 per ton, while the cost in the latter country is approximately $70 per ton.

The difference in cost would appear to be to the advantage of the Malayan system of production, but the advantage is more apparent than real. It must be remembered that the Italian daily rate of wage of this work is equivalent to $1.40 to $1.85 for men and 70 cents to $1.80 for women, whereas the usual rates in Malaya are 50 cents for men and 40 for women.

The application of the Italian system to Malayan rice production—if it was possible in all respects and is assumed to be equally productive—would shew a decided decrease in the cost of production in comparison with the present costs in the respective countries.

The success of the Italian system may be summarised as being due to efficient water control, rotation of crops, thorough cultivation, heavy manuring, adequate scientific advice, heavy-yielding varieties of padi and the existence of an intelligent and industrious agricultural population.

The notable difference between this system and the Malayan system is rotation of crops and heavy manuring.

It would seem that the degree by which Malaya can imitate successfully the Italian methods will depend largely on the provision of additional capital—a subject which suggests many difficulties at the present time.

An interesting point is that in the successful contribution of rice-growing and cattle grazing into one rotation, the Italians can claim to have solved successfully a problem which confronts the cultivation in certain parts of north Malaya, notably Kedah and Kelantan.

It seems at least desirable to ascertain whether a definite system of rotation could be alternated in Malaya whereby *sawahs* could be rested in turn from rice and devoted to grazing, and whether such a system would not of itself considerably benefit rice crops and cattle as contrasted with the present system whereby cattle are pastured on the *sawah* during the inter-crop period and pick up a living anywhere they can while the crop is growing.

The main difficulty which lies in the way of the adoption of such a system in Malaya is probably the small size of the individual holdings; on the other hand, the inherent possibilities appear to be well worth investigation.

The Planters Loans Board.

Twelve years ago an article was published in this Journal (Vol. VIII No. 2) which set forth the constitution and objects of the Planters Loans Board, Federated Malay States, with a synopsis of the Board's work for its first four years. Mr. St. L. Parsons, who has been Secretary of the Board from its inception, was the author of that article and he has now, at our request, and with the permission of the Board, revised the statement of the constitution and aims of the Board and added a brief account of the achievements of this scheme, which we have pleasure in including in this number.

The original object of the scheme was to grant loans to planters for the development of their land. Eventually, the scope of the Board's activities was widened to admit of loans being granted for any purpose which was held to assist directly in the general development of the Federated Malay States.

The author is somewhat modest in the brevity of his statement of the achievements of the Board, for which reason and in order to emphasise this

statement we reiterate the facts as stated in the article :—

" During the sixteen years that the Board has been a corporate body, it has dealt with 1040 applications amounting in the aggregate to $30,923,000. Loans to the number of 450 representing a sum of $12,411,000 have been granted. Repayments have totalled $10,517,000 and the amount outstanding on 31st December, 1931, was $1,893,000."

In addition, the Board administered the " War Service Land Grant Scheme " which must have entailed much additional work to the Board.

Coastal Soils.

In his article entitled " The Western Coastal Alluvial Soils," which is included in this number, Mr. J. H. Dennett carries our study of the soils of Malaya, which were discussed in this Journal in 1929, a step further.

In the present instance the author gives an interesting description of the method of formation of the soils encountered at the edge of the inland information.

It is stated that the character of the soils encountered in travelling to the edge of the inland information from the coast are respectively, coastal clays, organic soils and peats. The general characteristics of these three classes are stated and the influence of each on crops is indicated.

Various difficulties encountered in the drainage and other cultural operations on apparently similar coastal lands are explained. A study of this article by those engaged in agriculture within the areas indicated is likely to be of value, because it will shew the amount of drainage necessary and the probable cultural and other operations essential in each case to result in the maximum benefit to the crop and improvement to the soils.

Manuring Oil Palms.

A brief account is given in this number of the results obtained in 1931 of experiments on the manuring of oil palms. This statement should be read in conjunction with the article published in this Journal in March of this year which described the layout of the experiments.

While it is not claimed that the last word has been written in this subject, the article records that there is a definite increase of crop following the application of phosphate manures to 7—8 years oil palms on hill quartzite and peaty soils and that there is no reason to suppose that good results will not follow similar applications elsewhere.

A point which is frequently lost sight of in manurial experiments is the financial consideration. In this case, the authors shew that with palm oil at £20 per ton, an extra return at the rate of £3.9.0 and £6 respectively were obtainable on the two estates on which the experiments were conducted.

Unfortunately, the price of palm oil has now dropped to about £15 per ton, so that the profits of manuring would have been correspondingly less.

The economic aspect of manuring oil palms — and in fact any crop — necessitates a consideration of the price of the agricultural product at the time when the manures may be expected to affect the crop. Admittedly, at the present time such estimates of future prospects are open to doubt, but in the case of edible oils, we must admit that we take a somewhat optimistic view, and therefore consider that the indications of the effect of manuring stated in this paper are likely to bear a favourable relationship to market prices of palm oil.

The Malayan Exhibition.

The decision of the Malayan Agri-Horticultural Association to hold its annual exhibition at Kuala Lumpur during the August bank holidays, which we announced last month, has been favourably commented upon by our contemporaries. The Association's decision is particularly gratifying to its ardent supporters and to others who likewise consider that these exhibitions are of considerable benefit to the country.

The opinion has been expressed in some quarters, however, that the Association is courting disaster by persisting in holding an exhibition this year, because the present trade and agricultural depression will seriously affect the financial stability of the event. We have some personal experience of the financial aspects of past exhibitions in Kuala Lumpur which makes us convinced that the Association, by its decision, has everything to gain and nothing to lose. Even under present conditions, the event should not be a financial failure, while the fact that the activities of the Association can be continued unchecked by the depression of our agricultural industries is proof that it fulfills the objects for which it was formed and therefore justifies the support of the public.

Original Articles.

THE ITALIAN RICE INDUSTRY

BY

H. A. TEMPANY,

Director of Agriculture, S.S. and F.M.S.

The area cultivated under rice in Italy is, in round figures, 140,000 hectares approximately equal to 346,000 acres; the annual production therefrom amounts, on the average to about 6,500,000 quintals of grain (padi) or 650,000 metric tons.

This corresponds to an average yield of 46 quintals of grain per hectare or 1.87 tons of grain per acre, and is the second highest yield in any rice-growing region in the world. The highest yields are obtained in Spain where average returns of 63 quintals per hectare are recorded; the area under cultivation in rice is, however, much smaller in Spain than in Italy and amounts to 48,000 hectares only.

In Italy the crop is produced in a period of somewhat less than six months from the time the seed is sown to the time when the crop is harvested.

In British Malaya the average area under rice cultivation is 669,000 acres and the average crop is estimated to be 350,000 tons of padi, or 0.52 tons of padi per acre; the crop takes about 6 months to mature.

If the yields in Malaya could be brought up to the level of those which are obtained in Italy, the average annual outturn from the existing planted area would be about 1,250,100 tons of padi, equivalent to about 750,000 tons of rice, that is to say, the country would be rendered self-supporting in the matter of rice production without any addition to the existing planted area.

Viewed in this light the facts are sufficiently striking to warrant some investigations of the Italian rice industry.

Accordingly, with the approval of the Government of the Federated Malay States, and by arrangement with the Colonial Office, I paid a visit to the Italian rice areas in August and September, 1931, during a period of leave.

A visit to this region had previously been paid in 1929 by Mr. F. Burnett, formerly Divisional Agricultural Officer, Ceylon, and now Deputy Director of Agriculture in British Guiana, and I had the advantage of being furnished with a copy of this officer's report prior to my departure from England.

During my stay in the rice growing region I made my headquarters in the town of Vercelli, which is the centre of the locality where the rice industry is most intensively developed and the site of the Experimental Station for the rice industry.

After leaving Vercelli I paid a short visit to the International Institute of Agriculture at Rome.

The authorities of the Rice Experimental Station supplied me with very full information and much literature concerning the rice industry and rendered

NORTHERN ITALY
SHOWING AREAS IN WHICH RICE IS GROWN

assistance in seeing conditions in the field.

The authorities of the International Institute of Agriculture supplied some additional data regarding the rice industry and its relationships to Italian agriculture as a whole, they also furnished information regarding the agricultural policy of the Italian Government.

Acknowledgment is made of the large amount of assistance received from these sources.

General.

The Italian rice industry is confined to the northern part of the country, with the exception of certain very small areas in the centre and South, and is mainly contained in the regions of Piedmont, Lombardy, Venete, and Emilia.

The most important area is situated in the provinces of Novara, Pavia and Milan, and lies between Cremona on the east and the River Dora Baltea (a tributory of the Po) on the west; the river Po constitutes the southern boundary of this area while the City of Milan is situated on the Northern boundary. The most important part of this region lies around the town of Vercelli, where the area cultivated under rice is stated to amount to 45,000 hectares, approximately one-third of the total rice area in Italy. Smaller areas exist in the Provinces of Bologna, Mantova, Revigo, Cremona and Alossandria, and still smaller areas at a number of other points. The accompanying map illustrates the geographical distribution of the rice-growing regions and the approximate areas cultivated in the crop in each province.

Typically, the rice areas of northern Italy consist of level plains intersected by numerous rivers and torrents, the majority of which take their rise in the Alpine regions lying to the north and feed the Po, the largest river in Italy, which with its tributaries is in effect the key of the industry, inasmuch as they supply abundant water for irrigating the crop.

The History of Rice Cultivation in Italy.

It seems probable that rice as a crop must have been known to the ancient Romans as the result of their conquests in the East, and that its cultivation, at least in Sicily, existed in very early times. It would appear to have been introduced into northern Italy at some period in the fifteenth century; according to Professor Novelli (Director of the Rice Experimental Station) the first authentic mention of rice cultivation in historical documents occurs in a letter written by the Duke of Milan in 1475.

According to the same authority it appears that in 1540 A.D. there existed in Italy 5,591 hectares of rice, while in 1710 there were 38,644 hectares.

In 1810 the rice fields of Italy are stated to have aggregated 120,000 hectares with production of 1,600,000 quintals, while in 1860 the figure is placed at 145,000 hectares with a probable yield of 2,600,000 quintals.

Following the unification of Italy in 1860, agriculture in general and rice cultivation in particular, received a considerable impetus which was further

assisted by the opening of the Canal Cavour (the largest irrigation undertaking in Italy) in 1866. By 1870 the area cultivated under rice had risen to 232,000 hectares, the maximum ever attained.

About this time the opening of the Suez Canal administered a serious check to the industry inasmuch as it facilitated the competition of Asiatic rice with the locally produced article on the Italian and other European markets. Consequently, the cultivated area tended to diminish steadily during the ensuing years. For the five years immediately proceding the war the average total area cultivated was approximately 145,000 hectares.

During the war years and those immediately succeeding the war, the area diminished still further, partly as a result of labour shortage and partly on account of the invasion of the province of Venetia, and in 1920 the area under rice had fallen to 111,000 hectares. Since then the industry has again extended, and for the years 1929 to 1930 the average area cultivated has been 142,062 hectares.

On the other hand, the standard of cultivation and the yield per hectare have steadily increased since the beginning of the present century, as the result of improved methods of cultivation the average yield of grain has risen from 20.65 quintals per hectare in 1870 to 46.0 quintals per hectare in 1925—30, having considerably more than doubled in sixty years, while the aggregate yield has also increased from 4,810,000 quintals in 1870—74 to 6,622,000 quintals in 1925—30.

The accompanying table and graph show the area and production of rice in Italy from 1870 to 1930 in quinquennial periods together with data for individual years since 1925.

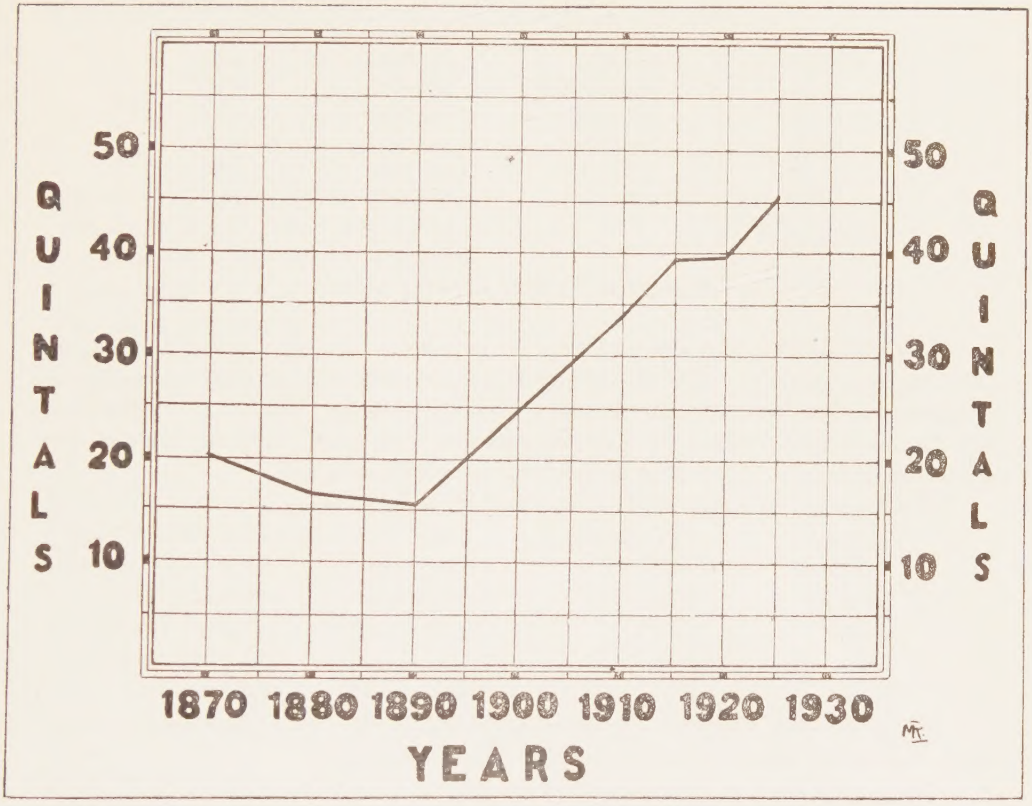
Italian Rice Production from 1870 to 1930

in Quinquennials.

Year.	*Area cultivated in Hectares.*	*Total Production in Quintals.*	*Yield in Quintals per hectare.*
1870—74	232,670	4,810,900	20.7
1879—83	201,850	3,584,900	17.8
1890—94	182,450	3,046,400	16.7
1901—05	175,365	4,434,500	24.8
1910—14	144,998	4,878,700	33.6
1915—19	138,616	5,218,300	38.6
1920—24	121,408	4,698,801	39.0
1925—30	142,162	6,621,795	46.0

Italian Rice Production 1870 to 1930

Average Yield in Quintals per Hectare.



Italian Rice Production from 1870 to 1930.

Years.	*Mean area cultivated in Hectares.*	*Mean total production in Quintals.*	*Mean Yield. Quintals per Ha.*
1870—74	232,670	4,819,900	20.7
1879—83	291,850	3,584,900	17.8
1890—94	182,450	3,046,400	16.7
1900—05	173,365	4,434,500	24.8
1910—14	144,998	4,878,700	33.6
1915—19	138,618	5,218,300	38.6
1920—24	121,408	4,698,801	39.0
1925—30	142,162	6,621,795	46.0

Annual Production from 1925 to 1930.

Year.	*Area cultivated Hectares.*	*Total production Quintals.*	*Mean Yield per Ha. Quintals.*
1925	143,380	6,416,000	44.6
1926	148,260	6,800,000	45.9
1927	142,180	6,961,000	49.0
1928	134,680	6,315,500	46.9
1929	137,091	6,737,030	49.1
1930	145,981	6,501,240	44.5

Climate of the Rice Growing Areas.

Climatically the rice growing regions possess a typically continental climate showing a rather low rainfall combined with considerable annual variations in temperature, hot summers alternating with cold winters. The total annual rainfall in the neighbourhood of Vercelli averages 735 m.m. with an average frequency distribution of 95 days in the year on which rain fell.

The average monthly rainfall at Vercelli is as follows:—

January	42.7 m.m.	July	56.8 m.m.
February	34.6 „	August	50.3 „
March	50.9 „	September	58.7 „
April	*82.1* „	October	*81.6* „
May	*80.0* „	November	66.0 „
June	*75.1* „	December	42.5 „

It will be seen that the wettest months are April, May, June and October, while the driest are December, January and February.

The maximum temperatures occur in July and range as high as 37°C. while the minima occur in January and February when temperatures of from 5° to 10° below zero Centigrade occur. The air tends to be rather humid on account of the large number of rivers and canals and of the irrigated areas, in consequence, fogs are common especially in the autumn. During March the prevalent winds are from the South while in the summer they are from the West. Siroccos occasionally occur.

Soils of the Rice Growing Areas.

The soils on which rice is grown are for the most part alluvial or alluvio glacial in origin. In the Vercellese region alluvio glacial soil types are prevalent throughout except in the neighbourhood of the river beds where they are replaced by recent alluvium.

The soil types generically may be described as a series of more or less sandy clays. In the Vercellese region the soils have been made the subject of an in-

tensive study by Dr. Luigi Boragic of the Rice Experiment Station and the following examples of physical and chemical analyses of soils are taken from his monograph entitled Il Vercelles.

The following analyses taken from his monograph entitled "Il Vercellese" illustrates the physical and chemical composition thereof.

Physical Analyses.

	No. 1	No. 2	No. 3	No. 4
	%	%	%	%
Coarse earth above 1 mm diameter ...	10.0	5.0	2.5	2.0
Fine earth below 1 mm diameter ...	90.0	95.0	97.6	98.0
Fine earth per cent. composition				
Coarse sand 1.0 to 0.1 m.m. ...	44.0	28.4	10.2	13.5
Fine sand 0.1 to 0.05 m.m. ...	14.2	26.0	20.3	16.0
Sandy clay 0.05 to 0.01 m.m. ...	25.0	29.5	43.0	40.0
Clay—below 0.01 m.m. ...	16.8	16.1	25.6	30.5

Chemical Analyses of Fine Earth.

Moisture ...	1.40	1.34	1.80	1.85
Organic matter (humus) ...	3.40	2.90	3.20	2.90
Calcium carbonate	Trace	Trace	Trace	Trace
Phosphoric anhydride } Sol. in 2 per ...	0.02	0.02	0.019	0.015
Potassium oxide } cent. Citric Acid ...	0.009	0.015	0.012	0.010
Total nitrogen ...	0.19	0.15	0.17	0.12
Total phosphoric anhydride ...	0.17	0.12	0.15	0.10
Potassium oxide } Sol. in ...	0.11	0.11	0.07	0.08
Calcium oxide } Conc. ...	0.49	0.65	0.49	0.60
Magnesium oxide } HCl ...	0.79	0.67	0.75	0.73
Acidity (pH.) ...	6.6	6.8	6.7	6.5

The lands to the north of Vercelli are, on the whole, rather more sandy in character than those to the south. It is somewhat surprising and very interesting to find that such excellent rice crops are capable of being grown on soils of relatively so light a character.

Chemically the soils are moderately well supplied with nitrogen and potash and fairly rich in phosphoric acid. They are very deficient in calcium carbonate; they are characteristically slightly acid in reaction their pH ranging from 7.0 to 6.6 although acidities up to 6.3 are recorded while still more rarely soils with an alkaline reaction occur.

Irrigation in the Italian Rice Areas.

As has been seen, the rainfall in the rice-growing regions is rather scanty and the crop depends entirely on irrigation for its water supply. There has, in consequence, been developed a very extensive, elaborate and efficient system

of irrigation canals. Some of these are of considerable antiquity, dating back to the thirteenth century, although the early undertakings were constructed mainly to serve the public and military requirements of the cities and for navigation.

Irrigation works to serve the needs of agriculture originated in the eighteenth and nineteenth centuries. All of them obtain their water from the River Po or its tributaries by means of barrages erected across their courses and together they constitute an elaborate network ramifying throughout the rice-growing districts.

The most important is the Canal Cavour opened in 1866 which takes its origin from the Po at Chivasso where an elaborate barrage has been constructed. The canal is 85.3 kilometres in length and has a maximum capacity of 100 cubic metres per second.

In connection with irrigation works, a number of hydraulic elevators and electric power stations have been constructed. Of these the largest is that of Villa Regia on the river Dora Baltea, an important tributary of the Po, at Mazze Canavese. This is the most important electric irrigation plant in Italy; it was completed in 1925; by means of enormous centrifugal pumps the water of the river is elevated to a height of 60 metres above the river and there delivered into irrigation channels. The total power developed by the station exceeds 10,000 H.P. and of this 2,000 is available for industrial purposes and is transmitted to the town of Turin in the form of high tension current. The maximum delivery of water from the undertaking is over 5,000 litres per second.

There are also a number of artesian wells that are utilised to supply water for irrigation.

Irrigation water supplied is paid for by means of water rates. The average cost of water for irrigating a hectare of land is stated to be about 120 lira.

Rice Cultivation as Practised in Italy.

Rice is cultivated in Italy on holdings which vary in size from one up to one hundred and fifty hectares and over. In the Vercellese region rice is grown in the course of rotations on 80 per cent. of the cultivated lands; of the area annually cultivated it is estimated 60 to 65 per cent. is composed of farms of 50 to 100 hectares in extent, 20 to 30 per cent. consists of holdings 2 to 10 hectares in area, the remainder comprising farms over 100 hectares in extent.

It is worthy of mention that the smaller holdings are usually worked by the owners while the larger farms are rented from landowners. The rent for rice lands is usually paid in kind and varies from 10 to 20 quintals of grain (padi)) per hectare according to the quality of the land.

Practically everywhere rice is now cultivated as a rotation with other crops; the form of the rotation varies somewhat in different localities but the constituents are usually rice, wheat or some other grain and grass. Formerly rice was cultivated year after year without rotation to a very large extent; it is now considered, however, that this form of cultivation leads to reduced yields owing

to defective soil aeration and consequent disturbance of the microbiological balance in the soil, while a further powerful argument against it is that it is held to increase malaria which was formerly a scourge in the rice areas. It would appear that in part it is the introduction of a system of rotation and the more intensive methods which it has led to which is responsible for the reduction in the area cultivated which has occurred in the past sixty years.

According to Professor Novello Novelli the rotation practised in the Vercellese region is one of seven years duration as follows :—

1st year — Wheat.
2nd and 3rd year Pasture.
4th to 7th years Rice.

In the Navarese Lomellina and part of the Milanese region it is an eight years rotation as follows :—

1st year — Wheat or Rye or Maize.
2nd, 3rd and 4th years — Pasture.
5th year — Wheat or Rye or Maize.
6th, 7th and 8th years — Rice.

In Emilia and Venetia a four years rotation is followed as follows :—

1st year — Maize or Hemp or Beetroot.
2nd year — Wheat.
3rd year — Pasture.
4th year — Rice.

It is interesting to note that, save in a minor degree in Venetia and Emilia where beetroot is sometimes grown, root crops do not appear to enter into the rotation.

Recently the cultivation of rice has become influenced to an appreciable extent by the Italian National Wheat Campaign which aims at increasing the return per acre of wheat lands and lessening the dependence of the country on imported wheat. In connection with it the practice of following a crop of winter wheat with a summer crop of rice is becoming increasingly prevalent in the Vercellese region. Instances are on record where as the result of the application of intensive methods, in a period of ten months the phenomenal yield of 100 quintals of grain, i.e. wheat plus rice, have been obtained from a hectare of land.

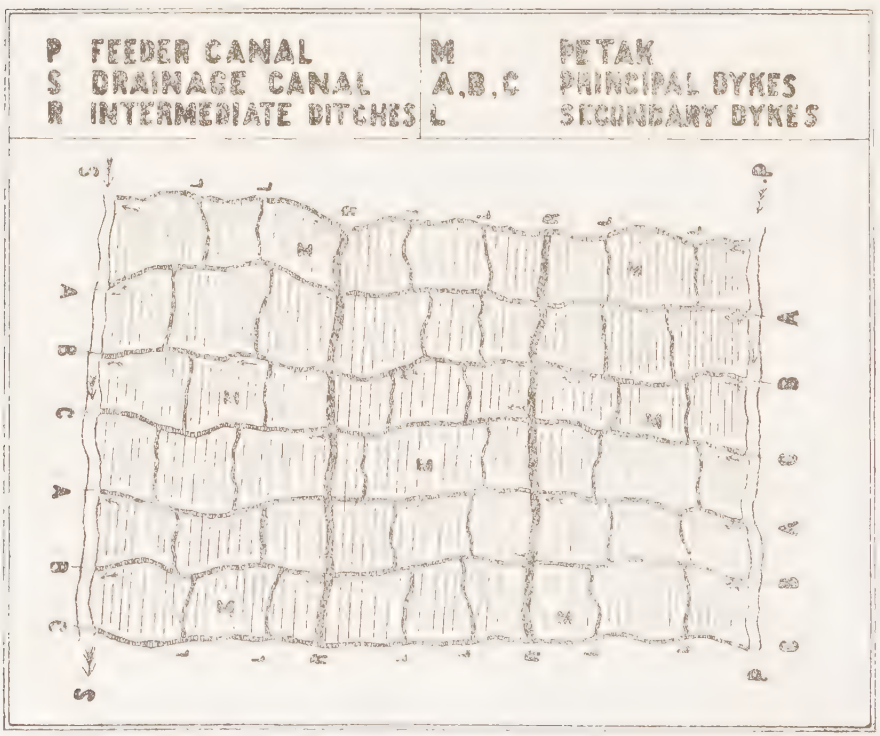
Normally rice cultivation lasts from the month of March to the month of October. The working up of the land for planting begins in the month of March. The first operation consists of ploughing the land, performed by either disc or mouldboard ploughs drawn by either oxen or horses, or on larger farming units by tractors. Ploughing is carried out to a depth of 18 to 22 centimetres. Formerly a depth of 10 to 13 centimetres was practised, but this is now considered to be too shallow. At the time of ploughing, the principal dykes for the retention of water (batas) are also constructed, running parallel with the direction of plough ing; they are formed by the plough and finished off by hand.

After ploughing, the fields are harrowed to reduce the soils to a fine and

uniform condition and to break up clods; thereafter the cross dykes are made by hand, the water retaining system is closed and water is admitted to the fields. The final levelling is then carried out, great attention is paid to this point as on it depends the satisfactory distribution of the water and the control of the crop. On the lighter lands it is usual to compact the soil and to render it less permeable by means of heavy rollers of stone or iron drawn by an ox.

The last work preparatory to sowing is the passing of an implement known as a "Spianoue" consisting of a long plank drawn by a horse on which the driver stands, which completes the levelling. The accompanying sketch reproduced from Professor Novellis work on the Italian Rice industry shows the general lay out of an Italian rice field. In general the size of the water compartment (Malay peta or lopa) is about similar to those seen in Kedah or Province Wellesley and larger than in Kelantan, Perlis or Malacca. The arrangement of the fields is, of course, much more orderly with their regular sequence of irrigation and drainage canals. The general run of the lands is very level reminding me very forcibly of the Malayan rice areas particularly in Kedah and Kelantan. To the latter country the soil type and general physical conditions show distinct similarity.

Diagram of the Lay-out of a Rice Field in Italy.



Heavy manuring is the universal practice in the Italian rice industry. The combination of grazing with rice cultivation renders available a certain quantity of farmyard manure for use in the industry and this is extensively supplemented by artificial manures. Farmyard manure is applied at the time of ploughing, dressings of artificials are applied partly before and partly after planting. Various mixtures are utilised the formulae recommended by the Director of the Rice Experiment Station being as follows :—

For rice lands which are being planted in rice for the first year after being under grass—

At the time of sowing—

Basic Slag or Superphosphate	...	5 quintals per hectare
Chloride or Sulphate of Potash	...	2 „ „ „

After the crop has been established and after the first weeding in the month of June—

Mineral Superphosphate	...	3 quintals per hectare.
Sulphate of Potash	...	1 „ „ „
Sulphate of Ammonia	...	2 „ „ „

For rice lands which were cultivated in rice during the preceding season—

At the time of sowing—

Basic slag or Superphosphate	...	5 quintals per hectare.
Sulphate of Potash	...	2 „ „ „
Sulphate of Ammonia	...	3 „ „ „

After the first weeding in the month of June—

Mineral Superphosphate	...	3 quintals per hectare.
Sulphate of Potash	...	1 „ „ „
Sulphate of Ammonia	...	1 „ „ „

Recently calcium cyanamide has begun to assume importance as a source of nitrogen in partial replacement of sulphate of ammonia; it is held that the lime therein contained is of particular value in view of the poverty of the soils in calcium carbonate.

It is not clear, however, how far the efficiency of the dressings given above has been established as the result of systematic experiment or how far they are empirical.

The planting of the crop takes place between April 1st and May 1st; it is performed for the most part, by planting seed directly in the field either by broadcasting by hand or by sowing in drills by means of a machine. In general, sowing by machine is confined to the larger properties.

When sowing is done by hand it is carried out immediately after the passage of the Spianone when the water is still turbid and the land is covered with a thin layer of fine mud which is held to facilitate the germination of the seed and the development of the root system of the young plant. When sowing is performed by machine the land is somewhat drier and is not completely covered with water. The type of machine used is that of a seed drill sowing eight to ten lines at one time. In the Vercellese region sowing by hand still predominates, but

mechanical sowing is considered preferable since it facilitates subsequent weeding and consumes less seed.

When broadcasting by hand is practised 130 to 160 kilogrammes of seed are required to plant a hectare, when planting by machine is employed the amount is 120 to 130 kilogrammes per hectare. Of recent years increasing attention has been directed to the establishment of the crop by transplanting seedlings raised in nursery beds; the practice has been extensively advocated by the Rice Experimental Station. When transplantation is practised, the seed is sown in nurseries at the rate of 550 to 600 kilogrammes per hectare and when the plants are 40 to 50 days old they are transplanted to the fields. It is estimated that one hectare of nursery will give sufficient seedlings to establish about 9 hectares of transplanted rice.

Planting distances for transplanted rice vary somewhat according to the character of the land. It is customary to plant out the seedlings in bunches of 3 to 4 plants per bunch in rows distant apart 25 centimetres and with 25 to 30 centimetres between the bunches.

It is claimed that transplantation induces higher yields, gives a more regular stand, thus lessening supplying and facilitating weeding operations, and shortens the period during which the crop occupies the land thereby rendering easier the planting of preceding crops of winter wheat or leguminous covers which are turned in for the purpose of enriching the soil, while in addition it shortens the period during which the land is submerged which favourably affects the biological conditions of the soil and moreover effects economies in water consumption.

It is stated that in the year 1928 about 10 per cent. of the entire rice crop of Italy was transplanted. At present the work is for the most part performed by hand, women being employed for the operation. The main difficulty in the way of the more extended application of the method apparently lies in the provision of the additional labour. It is claimed that the value of the additional yields and the additional products which can be obtained more than counterbalance the additional expenditure which the process involves.

To obviate the difficulty of labour shortage a number of transplanting machines have of recent years appeared on the market, and in 1926 and 1928 international competitions for transplanting machines were held near Vercelli. There are now about 16 different machines on the market of which three are semi-automatic and the remainder fully automatic, and it is understood that the best are fully satisfactory.

Varieties of Rice Cultivated in Italy.

During the four hundred years in which rice has been cultivated in Northern Italy a very large number of varieties have been grown and many changes have taken place. The origin and nature of the earlier varieties grown is obscure, but it is known that in 1875 the chief varieties cultivated were two in number called respectively the Nostrale and the Bertoni; they were apparently rices of high quality but low productive power which succumbed rather easily to disease.

In the year named a large number of varieties were imported from abroad and from that time until 1906 many varieties were grown which were either imported or had arisen from natural crosses in Italy.

In 1906 the variety Originarie Chinese probably imported from Japan a few years earlier, began to assume prominence and it is still the most widely cultivated variety.

With the foundation of the Rice Experiment Station in 1908 the question of rice varieties began to receive more systematic attention and a great deal of breeding and selection work has since then been accomplished.

The methods adopted have consisted in a combination of the importation of varieties from other countries with the systematic improvement of both existing and newly imported varieties by botanical means.

Importations are made regularly by the Rice Experiment Station and the newly imported strains are subjected to trial and judged on the results thereof. It is stated that two or three years are required for imported varieties to become acclimatised to Italian conditions and an opinion cannot be given of the suitability or otherwise of a variety until it has been subjected to trial for this length of time. Importations have been made from the majority of rice-growing countries and have yielded a large number of promising strains.

The reliance which is placed on importations is noteworthy.

Botanical methods employed for the improvement of the crop are threefold and comprise mass selection, pure line selection and hybridisation.

Mass selection is employed very extensively by planters throughout the rice-growing areas for the maintenance and improvement of their crops. It consists essentially in the selection each year of a sufficient number of ears from individual strains to form progeny plots which in turn furnish material for the planting of the general crop in succeeding years. In this work the Station assists.

Pure line selection is carried out by the Experiment Station itself and follows the ear-to-row method which is the basis of similar work in Malaya and elsewhere.

Hybridisation has only lately been embarked on and is at present being carried on experimentally by the Experiment Station; a large number of first and second generation crosses have been established and the attempt is now being made to fix their characters. So far, no hybrid varieties (except a few natural hybrids) have found their way to cultivation, but the work is regarded as of considerable potential importance and it is hoped that it will in due course lead to the establishment of a number of valuable new varieties.

Details of the technique of the methods utilised in both pure line selection and hybridisation have been obtained from the station and are available for reference.

Samples of four of the best strains established by pure selection have been obtained from the Experiment Station and sent to Malaya for trial.

It is noteworthy that owing to climatic conditions all of the rices cultivated have to be of the short maturing kind, and that notwithstanding this, yields obtained far exceed those obtained with long maturing kinds under Malayan conditions.

At present there are about 30 varieties of rice actually under cultivation commercially in Italy, while a considerable additional number are under trial. As stated, the number is constantly being added to by the experimental work in progress. The list of the principal varieties is as follows :—

Common Varieties :

Chinese Originario, Americano 1600, Onsen, Sancino, Sekiama, Precoce Giallo Ardissone, Precoce Vittoria, Roncarelo and Benlooh.

Semi fine varieties :

Precoce Novella, Precoce Alloric, Lencino, Ranghino, Greppi, Maratelli, Precoce 6, Precoce Dellarole, Chinese Ostiglia, Rosso Gorei and Precoce Americano.

Fine Varieties :

Settala, Nero di Vialone, Ostiglia and Bertore.

Varieties recently selected :

Giros, Sancio No. 9, Tavallini, Vercelli, General Rossi, Riccardo Restano and Precoce San Giacomo.

Cultivation of the Rice Crop after Planting.

Once the rice crop has been established it is kept fully submerged during the period of growth until shortly before the harvest, to a depth of 8 to 15 centimetres. The quantity of water required to mature a crop varies according to the character of the soil and ranges from a flow of one litre per second per hectare for heavy lands to ten litres per second per hectare for light lands, the average for the general run of rice lands in the Vercellese region being from two to four litres per second per hectare. Great importance is attached to the effective performance of weeding operations on the crop, usually three weedings are given during the growth of the crop and the expenditure constitutes the largest single item in the cost of cultivation. The weedings take place at intervals of from fifteen to twenty days during the months of June and July and are performed either by hand or by machine, the employment of weeding machines being only practicable when the crop is planted by machine or is raised from transplanted plants.

For hand-weeding, women are mainly employed and there is a considerable immigration of labour into the rice regions each year for the weeding season.

The reaping of the crop is at present performed entirely by hand, there is no mechanical difficulty in the way of the employment of reaping machinery, but I gather that the main difficulty is that the farming units are insufficiently large and the owners are indisposed to combine for the purpose of operating such machinery collectively.

When reaping the crop the stalks are cut at about 30 centimetres from the ground level and made up into sheaves, which are generally transported to the farm buildings for threshing, on account of the fact that showery weather is by no means uncommon in the harvesting months of September and October.

Male labour is employed for the reaping operations and there is considerable immigration for this operation also.

After transportation to the farm buildings the rice is immediately threshed, mechanical threshers of the ordinary type, usually operated by electricity, being employed. The work of threshing usually proceeds day and night so as to enable the heat of the sun to be used to the maximum possible extent for drying the grain during the rather showery autumn weather.

The greater part of the crop is air-dried on concrete or stone floors, the rice being frequently turned over during drying by means of wooden rakes. At night the drying grain is raked together in heaps and covered over with tarpaulins. The labour involved in drying is performed by women, and the operation is complete in three days. After the drying is completed the crop is winnowed by means of a winnowing machine and subsequently placed in store.

Owing to the liability of showers during the reaping season, some attention has lately been bestowed on the possibility of installing artificial driers for the drying of the crop. One such machine has been installed at the Rice Experiment Station.

After the harvest the crop is held by the farmers and disposed of to the milling factories according to the state of the market during the ensuing months. The milling factories, of which there are a considerable number in the rice growing areas, are owned and operated independently from the farmers. In Vercelli itself there are seven such milling factories.

The farmers are financed by means of advances from the local banks, there are no co-operative organisations for financing the growers or for disposing of the crop. There has, however, I am informed, recently been a move towards the establishment of consortia for the purchase by farmers of fertilisers.

Labour in the Rice Industry.

As will have been seen from the foregoing remarks, both male and female labour is employed in the Italian rice industry. The heavier cultural operations, such as ploughing, making up dykes, sowing and harvesting, are performed by men, while the lighter work, such as finishing dykes, weeding, transplanting and drying the grain is done by women.

The number of labourers employed per hectare, on the average, for the crop varies in different districts; where the cultivation is most intense, as in the neighbourhood of Vercelli, it approximates to 0.72 elsewhere it may run as high as 2.4.

The labour employed falls into two classes namely :—

(a) labour which is permanently resident in the rice growing districts and

(b) immigrant labour which is imported into the rice areas each year from about 17 different provinces for the weeding and harvesting operations.

Recruitment of immigrant labour is effected through a central recruiting agency which is situated at Reggie, Emilia.

Engagement of labour is regulated by contract the terms of which have been approved by the Italian Government on lines agreed between the farmers' unions and the labourers' organisations. The contracts provide for the period of the engagement, the number of hours of work per day, the rates of wages to be paid for different types of work and for the payment of health, old age and accident insurance.

The ordinary number of hours per day required from labourers is seven in the winter and eight in the summer; there is also provision in contracts for overtime and piece work.

All farms are required to provide suitable accommodation for resident and particularly for immigrant labour. Consequently all the larger farms are provided with labour barracks which, when they are not occupied by labourers, are used as stores for grain.

Labourers wages range from Liras 15 to Liras 22.50 per day for men and Liras 8 to 21 per day for women according to the type of work that is being done. It may be added that it appears that the operations of harvesting and threshing are not infrequently paid for wholly or in part in kind.

Farms Lay-out and Equipment

The lay out of farms of average size follows a more or less standard pattern. The farm buildings are usually situated more or less centrally to the cultivation and are arranged in the form of a rectangle surrounding a courtyard which is employed during the harvest for drying operations.

The buildings are usually well constructed and comprise barracks, stores, implement sheds, stables for working animals and not infrequently, a byre for dairy cattle as dairying is to a certain extent combined with the rice industry and for this the entrance of pasturing into the rotation provides very well.

Much attention is now paid to malaria prevention in the rice-growing areas; I am informed that this disease was formerly a scourge in this part of the country, but as the result of the preventive measures adopted its incidence has been reduced to almost negligible proportions.

The Economics of Rice Cultivation in Italy.

The cost of cultivating a hectare of rice as established from published figures and from data supplied to me by the Rice Experiment Station appears to be approximately Liras 5,000. The data quoted in different sources vary somewhat *inter se* but the following summary appears to give a fair approximation to accuracy under average conditions.

Approximate costs of cultivating one hectare of rice.

	Liras per hectare.
General charges including rent, taxes, insurance and supervision ...	1,850
Water charges ...	120
Manures and application ...	880
Ploughing, harrowing and making dykes ...	430
Seed and sowing ...	250
Weeding ...	750
Harvesting, transporting and threshing the crop	780
Total ...	5,060

Reference to the table on page 277 will show that the average return for the past five years for the whole area cultivated in rice in Italy has been 46.0 quintals per hectare, while in individual years the returns have ranged between 44.6 and 49.1 quintals per hectare.

The market price for unhusked rice at the present time lies between 50 and 60 liras per quintal, the actual average for the year 1930—31 to March being Liras 58.30. At this value the industry is being carried on at a considerable loss. It is, however, to be noted that the market for rice is very much below the normal level as the result of the world depression and that under normal conditions prices range between 120 and 140 liras per quintal and at this figure, on the basis of costs indicated above, the cultivation of rice yields a profit of Liras 1.000 to 2.000 per hectare when a yield of 50 quintals per hectare is obtained.

The market for the crop lies partly in Italy and partly in other countries, the percentage of exportation being about 25 per cent of the entire crop. The main countries to which exportation takes place are the Argentine Republic and Chile.

Pests and Diseases of the Rice Crop.

The Italian rice crop is stated to be little subject to pests and diseases, the only serious malady which occurs being a form of stem rot.

Stem borers apparently do not occur, at any rate, as a serious pest.

Rats are liable to occasion considerable damage if uncontrolled, they are combatted by systematic trapping and poisoning. The most efficacious poison has been found to be zinc phosphide which is sold commercially in considerable quantities for the purpose of destroying rats in rice fields. It is employed mixed with broken rice in the form of a paste which is made up into balls and distributed along the dykes in the rice fields. The formula used is as follows :— zinc phosphide 1 kilogramme, broken rice 20 kilogramme, water 3 Litre.

Fish Culture in Connection with the Rice Industry.

An interesting adjunct of the rice industry is the raising of carp, which is carried out to some extent in the rice fields on lines somewhat parallel to the manner in which it is conducted in Java.

The young fish are liberated in the rice fields soon after the water has been admitted thereto and are allowed to remain therein until the water is drained off just prior to the harvest, at which time they are lifted and transferred to basins specially dug for the purpose of containing them during the winter months. They are retransferred to the rice fields in the ensuring spring when the water is readmitted thereto.

It takes three years for such a fish to come to maturity and when mature they weigh from three to four pounds.

Efforts are being made further to develop the industry and in this the Rice Experiment Station assists by raising and distributing young fish.

The Experiment Station of the Italian Rice Industry at Vercelli.

This organisation was founded in the year 1908. It is supported partly by interest on a central fund which was created after the war and partly by contributions from the various rice-growing districts—from the farmers, syndicates etc. Its affairs are administered by a Board of Direction and there is also an Executive Committee. Its work is in charge of a Director, while there is an Assistant Director who is also chief of one of the Divisions. The station is organised in five divisions namely:—Botanical, Chemical, Engineering, Agricultural, and a Division of Fish Culture.

Each Division is under the charge of a Divisional Chief with one or more trained Assistants, save that at present the head of the Botanical Division is also in charge of the fish breeding work.

The head-quarters of the Institution are situated in the town of Vercelli and comprise laboratories for Chemistry and Botany, together with Offices, Library, Museum and Board Room.

The field experiment station is situated three kilometres outside of the town and comprises about 40 hectares of land with office, labourers' barracks, stores, implement sheds, pot culture shed, field laboratory for botanical work and a byre which accommodates about twenty cattle. Some additional buildings are in course of erection and it is intended in due course to transfer the botanical laboratories to this site.

The work of the station concerns itself with breeding, selection, acclimatisation and trial of varieties of rice, with manurial experiments, with chemical and physical work on soils and on rice itself, with agricultural engineering problems including irrigation, farm machinery and the like and with fish breeding work.

Latterly the station has also undertaken a certain amount of research in connection with the National Wheat Campaign with special reference to the wheat-rice rotation already referred to.

The institution also gives advice to farmers in connection with problems affecting the crop, assists them in relation to the mass selection of seed on farms and carries out a large number of co-operative experiments on properties throughout the rice-growing area of Italy.

There is no special section of the Institute devoted to the study of questions connected with the pests and diseases of the rice crop; as stated, these are at present considered to be of minor importance; when such questions arise, assistance is invoked from the experts attached to the Agricultural Institutes at Milan or Turin.

The results of the work of the station are published in an excellent series of monographs, while a small periodical dealing with agricultural questions and research in connection with the rice industry together with occasional leaflets are also issued.

It is considered that the station has played a very important part in assisting to bring about the very marked improvements in Italian rice cultivation which have occurred during the past twenty-three years.

It constitutes an excellent example of the single crop type of experiment station.

Summary and Conclusion.

This concludes the outline of the conditions under which the Italian rice industry is conducted. At present, in common with practically all other agricultural industries, it is suffering from the effects of the world depression, but in normal times it is productive of adequately remunerative returns.

It constitutes an example of the manner in which an industry, which has in the East, at any rate until quite recently, been exclusively regarded as capable of successful prosecution only by Asiatic agriculturists with a low standard of living, can hold its own under natural conditions which cannot be regarded as ideally suited thereto, can be operated with relatively highly paid European labour and can yield considerable profits as the result of the application of intelligent and progressive methods.

It is interesting to compare the data with those adduced in relation to the Australian rice industry and to the attempts at mechanised rice cultivation in Southern Siam lately published in the *Malayan Agricultural Journal,* also with the accounts of the rice industry in California and the Southern States of America in Copeland's well-known book on rice.

The conditions which have led to the present high returns in the Italian industry may be summarised as follows:—

1. The provision of an effective system of water control which allows of water being got on and off the fields when crop conditions require it.
2. The working out of a rotation system which allows of the lands being rested from rice cultivation periodically with consequent benefit to the biological conditions of the soil.

3. The provision of deep and thorough cultivation.
4. The working of a system of regular and heavy manuring.
5. The provision of heavy-yielding varieties suited to the conditions under which the crop is grown.
6. The provision of adequate scientific advice and guidance for the industry through the Rice Experiment Station.

That these results have been possible is due to the existence of an intelligent and industrious agricultural population.

Provided that the conditions set out above can be satisfied there is no obvious reason, so far I can see, why equally satisfactory yields should not be capable of attainment in Malaya for example.

References.

1. La Risicultura in Italia by Prof. Novello Novelli and Ing Giovanni Sampietro 1924.
2. Institut Internationale d'Agriculture. Resultats des Recoltes en 1930.
3. The wheat campaign in Italy. Statement issued by the Italian Ministry of Agriculture and Forests 1931.
4. II Vercellese. Studt c recherche sui terreni e sulle acque d'irriganione by Dr. Laigi Boragio 1929.
5. Le Macchine Transpiantatrici per Riso 1929 by Ing Giovanni Sanpistre.
6. Le Varieta di Rise coltivate in Italia, by Dr. Riccards Chiapelli, 1930.

APPENDIX I.

Units used in the Report.

1 Hectare	=	2.47 acres.
1 Quintal	=	100 Kilogrammes.
1 Kilogramme	=	2.205 English pounds.
1 Metric Ton	=	1,000 Kilogrammes.
	=	10 Quintals.
	=	2205 English pounds.

Exchange rate on Gold standard £1 = 92.46 Liras.
Actual exchange rate at time of writing £1 = 75.125 Liras.

THE PLANTERS LOANS BOARD.

Federated Malay States.

BY

D. St. L. PARSONS,

Secretary, Planters Loans Board.

The Planters Loans Board, Federated Malay States is Incorporated by Enactment No. 27/1915: Amending Enactments No. 15/1920 and No. 6/1926.

The Government of the Federated Malay States originally decided to lend financial assistance to the development of the agricultural resources of the country in the year 1905.

Little, at that time, was known of the fertility of the virgin soil of the country and the estates in actual being were few and far between.

Applications for assistance for the first 2 to 3 years were negligible but as time progressed and the prospects of the successful cultivation of the Para rubber tree and the coconut palm became more widely known, with the alienation of considerable tracks of country for the purpose, bringing an influx of capital and a largely increased population, these industries—particularly rubber—rapidly assumed considerable importance. People—of all nationalities—already in the country, began to take a keen interest in the cultivation of rubber and, with the great development work going on all round and the evident desire of all to extend their interests, the Government system of loans to agriculturists steadily expanded, to such an extent that the Administration found itself somewhat seriously handicapped in coping with the situation.

With a roll of 136 estates—large and small—benefiting from loans to the extent of nearly $4,000,000 and applications still coming in, Government, towards the end of the year 1913 decided it would be expedient to put the whole system of loans on a better footing and, with this end in view, appointed an Advisory Board to review the position and handle all new applications.

This Board which consisted of:

The Director of Agriculture, S.S. & F.M.S. (*Chairman*)

The British Resident of Selangor

Two leading Planters

and the head of one of the largest mercantile concerns in the country came into being early in 1914 and one of the first steps taken was to advocate the engagement of a permanent staff. Government adopted this recommendation and the necessary staff was engaged in May of that year.

This Board continued to serve in an advisory capacity until towards the end of the year 1915 when a special enactment was introduced and passed in Council creating it an executive body under the style and title of

"The Planters Loans Board, Federated Malay States".

Constitution.

The Board, as such, is a body corporate and has continuous succession and

has and may use a common seal and may acquire, hold dispose of and otherwise deal with movable and immovable property and may sue and be sued in all Courts and in all manner of suits and proceedings and may do all matters and things incidental to or pertaining to a body corporate.

The members of the Board, who shall number not less than 3 nor more than 7, are nominated by the Chief Secretary to Government, Federated Malay States.

A member ordinarily retains his seat for a period of 5 years, unless expressly nominated for a shorter period, but he is at liberty to resign at any time and also, he may be re-appointed for a further term of service.

Members who absent themselves from the Federated Malay States for a period exceeding 2 months are deemed to have resigned their seats.

Not more than half the members may be officers employed in the Public Service.

The Chairman of the Board is nominated by the Chief Secretary to Government, Federated Malay States.

All nominations must be published in the F.M.S. Gazette.

The Chief Secretary to Government, Federated Malay States has power to remove any member from the Board or from the Chairmanship at any time by notification in the Gazette.

Funds.

The capital of the Board is $4,000,000, a sum set aside, by special resolution of Council, from public monies for the purpose.

The Government Treasury acts as Bankers to the Board in so far as the Board draws on the Treasury for its requirements (subject to the limit of $4,000,000). Inversely, all monies collected by the Board are paid in to the Treasury.

Loans.

Up to the year 1920, the grant of loans was restricted to one class of borrower only *viz*: "Planters" (Planting Companies, Syndicates and Individuals) but during that year the powers of the Board were extended to permit of loans to Co-operative Agricultural Societies and to small native Agriculturists. Again, in 1926, the scope of the Board's activities was further extended to admit of loans being made for any purpose, which in the opinion of the Board, would directly assist in the general development of the Federated Malay States.

The grant of loans is restricted exclusively for the benefit of land situate within the Federated Malay States.

In the case of agricultural loans, assistance is given, as a general rule, expressly to help immature properties to reach the producing stage and/or to equip them with buildings, plant and machinery.

The usual procedure is to issue such loans by monthly instalments on production of accounts for the preceding month and instalments may be withheld at any time if the Board has any doubt that the money is being improperly

expended or if the property is adversely reported on.

The terms usually prescribe for "repayment on demand" which enables the Board to call in the loan at any time if it is dissatisfied, but generally speaking, repayment is not demanded until such time as this is possible out of income derived from the land.

Urban and other loans are granted for fixed periods, repayable, as a general rule, by half yearly or yearly instalments based on the earning capacity of the property under charge.

Interest.

Interest on loans is charged by the Board at such rate or rates as may be in force at the time of making the loan.

The scale of rates is prescribed by the Chief Secretary to Government, Federated Malay States.

The usual rates for agricultural loans are 7½ and 8 per cent. and for urban and other loans 6 per cent.

Of the interest collected, 75 per cent. is credited to Public revenues while the remaining 25 per cent. is retained by the Board towards meeting its administration expenses and the creation of a reserve fund to cover possible bad debts.

Security.

The security required for all loans is a charge, registered under the laws of the Federated Malay States in force for the time being, of the land for the benefit of which the loan is made and, in the absence of any express stipulation to the contrary, the following conditions, in so far as they apply, are by law implied in all charges:—

(*a*) that the chargor will properly and judiciously use the moneys secured by the charge for the purposes for which the same are by the terms of the charge expressed to be advanced to him and will not use such moneys for any other purpose whatsoever

(*b*) that the chargor will pay at the times and in the manner required by the terms of the charge all amounts accruing due thereunder, whether by way of interest or otherwise

(*c*) that the chargor will duly comply with all conditions and obligations attaching to the title for the land charged, whether in respect of cultivation, building, payment of rent or otherwise, and will keep all buildings on the said land in good repair

(*d*) that the chargor will not transfer to any other person any portion of his interest in the land charged without the written consent of the Board under its common seal

(*e*) that the chargor will furnish month by month to the Board proper accounts of revenue from and expenditure on the land charged and such other information as the Board may from time to time require

(*f*) that the chargor will insure and keep insured in the name of and to the satisfaction of the Board all buildings, machinery and plant in or upon the land charged, except such as may be exempted by agreement, and all produce of the land charged from the harvesting of such produce until the sale thereof and that proper evidence of such insurance shall be produced to the Board from time to time as required

(*g*) that no dividend or bonus shall be paid to any person out of the profits arising from the land charged until all moneys secured by the charge shall have been paid to the Board in full

(*h*) that all profits arising from the land charged which are not required for the due cultivation and maintenance thereof shall be devoted to the payment to the Board of the moneys secured by the charge

(*i*) that the chargor will pay to the Board on demand all expenses which may be from time to time incurred by the Board in or about the employment of a person or persons to visit, inspect and report on the land charged

(*j*) that the chargor will pay to the Board on demand all costs, charges and expenses whatsoever which may be paid or incurred by the Board in any exercise of its rights or powers occasioned by default of the chargor in the observance or performance of any undertaking or condition expressed or by the Planters Loans Fund Enactment or otherwise implied in the charge

(*k*) that no part of the land charged which is not cultivated at the date of the execution of the charge shall without the written consent of the Board under its common seal be cultivated until all moneys secured by the charge shall have been paid to the Board in full.

Any special conditions may be imposed and inserted in the charge.

Collateral security may also be required.

Inspections.

All properties benefiting from loans are periodically inspected and reported on for the information of the Board. The cost of these inspections is payable by the borrower (see clause (i) in preceding paragraph).

Accounts.

Full accounts of all transactions are kept by the Board which are subject to audit by such person or persons as may be appointed for the purpose by the Chief Secretary to Government, Federated Malay States and the Board renders to Government each year, before the 31st of March, a balance sheet and relative documents setting out the position of all loans at close of business on the 31st day of December in the previous year accompanied by a report on the year's working.

General.

There is little doubt that the policy of Government in inaugurating a system

of loans to planters and others tended towards the more rapid development of the country than would, otherwise, have been the case and, at the same time, proved of considerable assistance to the borrower. It is believed that there must be many residents—past and present—who have good reason to be grateful for the Administration's foresight in creating facilities for aid being rendered in times of stress and assisting them through their difficulties. In general, this applies to all time and in particular to

(*a*) the year of the outbreak of the Great War (1914) when the financial situation became so difficult that many owners of properties would have gone to the wall had it not been for the assistance given by the Board.

(*b*) Again, the year 1918 when, owing to the uncertainty of the situation and the ruinous prices obtaining (mainly through lack of shipping facilities as the result of the Great War) the rubber industry passed through a nerve racking crisis

and

(*c*) yet again, the rubber slump 1920—1923.

With the imposition of the "Restriction of Rubber Exports Enactment 1922", the Board decided that the time had arrived for it gradually to withdraw from rendering further assistance to the rubber industry and in pursuance of this policy, fewer and fewer applications from owners of rubber lands have been entertained each year, the Board finally closing down on "rubber" in the year 1929 though a number of rubber properties still remain on the Board's books.

During the 16 years that the Board has been a corporate body, it has dealt with 1,040 applications amounting in the aggregate to $30,923,000. Loans to the number of 450 representing a sum of $12,411,000 have been granted. Repayments have totalled $10,517,700 and the amount outstanding on 31st December 1931 was $1,893,300.

War Service Loans

The foregoing takes no account of the loans made by Government to returned ex-soldiers under the "War Service Land Grant Scheme", a scheme formulated by Government in the year 1920, for assisting men, previously in employment in Malaya, who took part in the Great War.

This scheme provided for a free grant to each individual of 100 acres of land, on special terms as regards quit rent, with a loan to those requiring assistance up to a limit of $250 per acre at 6 per cent. per annum, subsequently reduced (from 1st July 1925) to 4½ per cent. per annum.

Government's commitments under this scheme amounted to $3,500,000 of which approximately one half, so far, has been repaid.

The administration of these loans was placed in the hands of the Planters Loans Board.

THE WESTERN COASTAL ALLUVIAL SOILS

BY

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In a previous article, a general description was given of the characteristics of the three more important inland soil types—*viz.* The Quartzite, the Granite and the Raub Series. In this paper it is proposed to deal in a similar manner with the soils of the coastal belt from Province Wellesley to the Negri Sembilan border.

The coastal alluvium is the youngest formation in Malaya both from the geological and the soil standpoint. Compared with other soils in this country it is unique in so far as there is no practical differentiation to be made between the soil as such and the geological formation. There is no parent rock underlying this soil, which may be pictured as continuing to great depths * ultimately overlying rocks with which it has no generic connection.

The inland soils formed (in the first instance by the weathering of parent rock) *in situ* undergo a continual process of erosion chiefly by the agency of water, the eroded matter finding its way to the rivers and the sea. The comparatively large particles of sand will tend to move along the swift-moving storm streams into the rivers and remain on the river bed, the current generally not being swift enough to move the large sand particles far. The silt particles being smaller, tend to be carried further and to be deposited nearer the river estuaries. The finest particles of all, clay, tend to be carried right to the river mouth where the influence of the salt sea water causes the fine particles to flocculate and be deposited on the sea floor until with the deposition of layer after layer of clay, fresh land is formed, to which the name coastal alluvium has been given.

There are certain possibilities with regard to the coastal alluvium which may be deduced from the general geological formation of the country. Reference to the map published in the *Malayan Agricultural Journal* for July 1929 will shew that there is a main range of granite hills running more or less parallel to the coast and extending roughly from latitude 6° N to 2° 30′ N. These hills are bounded on the west by undulating land of quartzite formation with breaks in the neighbourhood of Kulim, Taiping, Tapah and Seremban. To the west of the quartzite lies the coastal alluvium stretching in an unbroken belt of varying width (5 to 50 miles wide) from Central Kedah to the Selangor—Negri Sembilan boundary.

* Soil is here used in accordance with Dokutschajeffs definition "The layers of material lying on or near the surface of the earth which has been changed by natural processes under the influence of water, air and living and dead organic matter." This does not necessarily coincide with the agricultural conception of a soil.

There are a number of exceptions to this unbroken belt of alluvium, sandy beaches occurring at Morib, Jeram, an area seven or eight miles north of the mouth of the Sungei Tinggi, various parts of the Dindings, Malacca and Port Dickson. The last two places are outside the limits laid down above and so will not be considered here.

For the rest there are especial circumstances giving rise to the beach in each case.

Off the Jeram coast are a number of islands of quartzite formation and close again on the mainland is a quartzite hill, obviously an island until joined up by the deposited alluvium. This hill is in its turn being eroded and while the smaller particles tend to be carried far away, the larger sand particles are deposited close to the hill, at Jeram. Further, the tide and currents bring in sand eroded from the islands just off the shore while a third factor tending to the formation of a sandy beach at this point is deposition of sea shells brought in by similar agency.

The beach near Sungei Tinggi can be seen to consist entirely of ground up sea shells apparently deposited there by inflowing currents.

In the Dindings is a case of granite islands finally joined to the mainland by the deposited alluvium and now the granite undergoing erosion, deposits its large sand particles close at hand on the beaches, while the finer particles eroded are carried further out and deposited on the sea floor.

Morib presents a case where the sandy beach is very thin, the alluvium being encountered at one to six inches below the surface of the sand. The most probable origin of the sand is Jugra Hill some miles away, the sand having been conveyed to Morib by south-easterly currents.

It would be anticipated therefore that there is probably much resemblance between the coastal alluvium of the north and south, with modifications as one travels westwards from the junction with the inland formations.

These modifications may be quite considerable within the main soil type of coastal alluvium.

Generally speaking, the soils encountered in travelling to the edge of the inland formation from the coast are —

(*a*) Coastal clays
(*b*) Organic soils
(*c*) Peats.

These three soils together constitute the coastal alluvium, but each have certain readily distinguishable characteristics.

The balance of evidence indicates that the soil of the coastal alluvium formation which was first to appear was the coastal clay somewhere within a a mile or so of the neighbourhood of the present sea board. Such early coastal clay probably formed a bund giving rise to a lagoon between itself and the quartzite. The lake so formed presented the proper conditions for the formation of peat. Reeds and sedges probably first made their appearance along the margin further modifying the system while forest litter came in from the neigh-

bouring quartzite with the formation of marsh conditions along the edges permitting of a marshy forest vegetation. There was probably a rapid rate of mortality (but not of decay) among the flora of this region, their remains (which can be found in any peat area) further tending to fill the lagoon and enabling vegetation to spread nearer and nearer the centre until at last the lagoon as such disappeared leaving a peat marsh to the east and a clay marsh to the west. There would be an area between these two where there would be a great tendency for the organic peat to become mixed with the clay, giving rise to marshy land with intermediate properties. This is the area of the present organic soils.

Similar deductions have been made in connection with the Bera Lake, Pahang. This area of twelve square miles of swamp and semi-swamp has gradually been brought to its present condition from original deep water by the pioneering efforts of the water growing rasau (*Pandanus helicopus*). This grew on the border of the original lake and formed a barrier for the silt brought down by streams until other tree growth appeared on the area thus consolidated, the rasau gradually advancing as semi swamp conditions were brought into being behind it.*

Coastal Clays.

Under natural undrained conditions the surface soil of the coastal clays is usually grey in colour changing to a blue or a blue green at the level of the permanent water table. On land which has been drained, the soil is modified to a yellow, presenting mottling of a brick red. Such modification of the soil under good conditions of drainage is rapid. (A sample of blue clay kept in the laboratory more or less under field conditions has passed from the blue through the grey to the yellow-red state in a period of some nine months. Samples of blue or grey clay which have been air-dried and kept in bottles have taken up a uniform yellow colour.)

Within a mile of the coast, shallow layers of peat may be encountered at depths varying from one to three feet, and never more than a few inches in thickness, usually with blue clay and a permanent water table immediately below. This seems to indicate possibilities of the surface layers being of considerably more recent origin.

Where present day plant remains occur in the subsoil there is usually a strong smell of sulphuretted hydrogen and organic sulphur compounds particularly noticeable where such remains consist of nipah roots, as much as 0.35 per cent. having been recorded. There is probably also sulphur present as iron pyrites. Such soil is usually very acid (pH3.0 and below) the acidity usually increasing with aeration due to the conversion of the sulphur compounds to free sulphuric acid.

Beds of sea shells are frequently encountered as far as two to three miles

* The Malayan Forester Jan. '32 page 103 "The Bera Lake".

inland at depths varying from four to ten feet, indicating possibly a coast line of mesozoic times.

The coastal clays, contrary to expectation, shew a considerable variation in texture though from casual inspection they all appear heavy. The variation is due almost entirely to the quantity of fine sand present. As far as the area between Province Wellesley and Negri Sembilan in concerned, all the light soils are situated in South Selangor. This may be due to old river beds which have meandered over this area and possibly to some extent to the fact that towards its southern extremity the coastal formation adjoins the Raub Soils and not the quartzite.

	Clay	Silt	Fine sand	Coarse sand	Loss on Ignition.
Averages for the heavier soils are :					
At surface ...	50	30	12	less than 1	14
At 30 inches ...	55	27	10	less than 1	10
Averages for the lighter soils are :					
At Surface ...	25-15*	20	50-60*	less than 1	10
At 30 inches ...	40-30*	20	35-45*	less than 1	10
The limits encountered are :					
Heavy Soil ...	70	22	3	Nil	11
Light Soil ...	14	30	55	Nil	5

From chemical analysis the coastal clays appear considerably richer in ultimate plant nutrients than soils of the inland formations. As results rather shew that in this country the available nutrients are a definite portion of the "total", (HCl extract) the coastal soils therefore tend to have considerably more nutrients in an available condition. The lighter soils tend to be poor in this respect.

Typical "total" percentage figures are as follows :—

	Lime (CaO)	Potash (K_2O)	Phosphates (P_2O_5)
Heavier Soils (Coastal)	0.13	0.80	0.04
Lighter Soils (Coastal)	0.02	0.20	0.02
Quartzite (Inland)	up to 0.05	up to 0.10	up to 0.02
Granite (Inland)	up to 0.04	up to 0.05	up to 0.02

Chlorides vary with geographical position and drainage. The maximum encountered on a heavier soil nearer the coast was 0.4 per cent. and the minimum occurring in the centre of an alluvial area was nil.

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* Double figures shewn as the general variation is much greater than in the heavier soils.

Peat.

The peat belt (i.e. where in undrained condition there is at least three feet depth of peat on the surface) lies contiguous to the quartzite on the east, the distance of its western limits from the sea shewing such a large variation that it is quite impossible to give a figure. It is doubtful, with the possible exception of the unexplored hinterland of the Sungei Tinggi, if it ever becomes more than about eight miles wide, while in parts the belt dwindles away where the quartzite come unusually near the sea. In such cases the quartzite is immediately in contact with the coastal clay.

The peat is usually a brownish black at the surface and a reddish black below becoming increasingly ruddy and finer in texture with increasing depth.

The average moisture content of peat in the field is about eighty per cent. on a wet basis while over eighty per cent. of the dry material is organic, that is to say that four per cent. or less of the weight of a freshly taken sample will remain after ignition. It is usually very acid (pH suspension circa 3.0 or below).

Microscopically the higher strata of the peat shew a cellular woody structure with considerable resinous inclusions, but by the time a depth of four feet has been reached this structure is not pronounced. Depth is known to vary between three and forty feet, the underlying soil varying from quartzite clay to coastal clay according to the position at which the sample is taken.

Organic Soils.

These soils lie geographically between the peat and the coastal clay. In properties they may be considered as intermediate between these two formations. They are really coastal clays containing over twenty per cent. of organic matter, the latter probably being originally present as intermixed peat.

General Cultural Characteristics.

The western alluvial coastal belt can be regarded as the richest soil *per se* in Malaya. Owing to the nature of its formation, however, the land is flat and most of the soil is heavy so that chemical richness is balanced to some extent by difficulties of drainage.

Where adequate drainage is possible, coconuts and rubber thrive well while the alluvium of the Krian district testifies to its possibilities for padi, though this area may be regarded as rather exceptional being abnormally rich in phosphate.

As pointed out above, the coastal clay can shew a fairly wide range of composition both physically and chemically but owing to the fact that these differences are largely due to the presence of varying amounts of fine sand it is extremely difficult to judge the properties of a coastal clay on its appearance in the way that the value of an inland soil may be appraised.

The inability to recognise in the field difference in mechanical properties has given rise to many difficulties on certain coconut areas. It has been a matter

of observation in the laboratory that where analysis shews large amount of fine sand, poor coconuts are found, and in many cases it appears highly probable that poor growth has been accentuated by the fact that these soils (containing fine sand) have been given exactly the same drainage as soils which look similar but which, in point of fact, are of much heavier composition.

The question of soil acidity is of great importance with coastal soils owing to the great variation encountered. Further, it rarely happens that the pH value is constant through any given profile but generally shows either increased or decreased acidity with depth.

On peat areas most permanent crops seem to thrive well during their early stages, shewing much better growth than the neighbouring non-peat areas. On these areas shewing good early growth it only too frequently happens that crops such as coconut and oil palm subsequently become very sickly. It appears that during the early stages the roots are thrust deep into the peat and after a year or two they encounter the water table which usually occurs at the junction of the peat and the underlying clay. If, on the other hand, peat is well drained before planting it rapidly shrinks to a dry powder which it is almost impossible to recondition. It is therefore necessary to drain such areas slowly but rather in advance of the rootings, so that when the roots reach underlying clay they will be above the water table. This is only possible where the underlying clay is friable. When the clay is of the heavy blue variety its acts very much like a smooth concrete drain, the water tending to run over it rather than permeate through it to reach a lower-lying drain.

Where peat is very deep, such that underlying clay is not reached after careful draining to a considerable depth, no crop seems to thrive with possible exceptions in rubber and pineapples and these only to a moderate degree. The pineapples, though large, tend to be coarse and acid, the rubber weedy with abnormal lateral rooting.

The best of the peat area seems to be where it is contiguous to the quartzite and has to some extent become intermixed with it. In this narrow belt most crops appear to thrive, the appearance being much superior to that of similar vegetation on either the neighbouring peat or quartzite.

The organic soils which present a mixture of a clay and ancient peat have not the cultural character of the quartzite peat mentioned in the last paragraph but they have the advantage over the coastal clay of being much more readily worked. Excessive drainage is to be avoided.

In conclusion it may be remarked that although this article is based on detailed observations only between the limits of Province Wellesley and the Negri Sembilan border, isolated samples received from coastal alluvial areas in Kedah, Malacca and Johore are in agreement with the observations made in this article.

OIL PALM MANURIAL EXPERIMENTS*

A general description of the layout of the Departmental experiments has been given in the *Malayan Agricultural Journal* for March 1932. Demarcation of plots, application of manures, recording and supervision have been carried out by the Agricultural Division.

Manures were applied in July and August 1930 and gave no significant increases for the second half of that year.

Results for 1931 are shown below, expressed as weight of fruit (bunches) per mature tree and as percentages of the controls. Figures per mature tree rather than per plot have been used in order to overcome the inaccuracy which would have been introduced into the latter figures by the presence of supplies. The majority of plots contained 9 or 10 trees in July 1931, only a few falling as low as 7. Had plot yields been used the conclusions drawn below would not have been affected.

Yield 1931 (in lbs. of fruit (bunches) per mature tree).

Treatment	*Estate A*		*Estate B* (On organic soil)		*Serdang*
Nitrogen, Phosphate, Potash (NPK)	221		182		
		234		167	179
Nitrogen, Phosphate, Potash, Magnesium (NPK Mg)	260		145		
Phosphate, Potash (PK)	199		169		
		200		186	237
Phosphate, Potash, Magnesium (PK Mg)	200		213		
Phosphate (P)	243		233		
		240		222	182
Phosphate, Magnesium (P Mg)	235		205		
Control		166		105†	158

The addition of magnesium sulphate to the more usual manures has produced no constant nor large increases.

Taking the Magnesium (Mg.) and no Mg. treatments together and expressing controls as 100 we have

		Estate A	*Estate B*	*Serdang*
NPK	...	141	159	113
PK	...	120	178	150
P	...	146	212	115
Control	...	100	100	100

Increases over controls (= 100) which are statistically significant (P = 0.05) are

Estate A 22 per cent. B 37 per cent. Serdang 96 per cent.

which has the meaning that under the conditions obtaining the chances are 20 : 1 against values equal to or greater than those given being attained by chance.

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*Compiled from Departmental records by W. N. C. Belgrave.

†The "control" plots on Estate B include two limed plots. Liming had no appreciable effect on yield.

It may, therefore, be wagered with some security that on Estate A NPK and P and on Estate B all treatments have largely increased yields, while no certainty can be attained in the case of Serdang (largely owing to the employment of too few replicates — three as against five or six on the two estates).

It is noteworthy that the highest increases have been given by the simplest (and cheapest) fertilisers; potash on these results must be regarded with suspicion. Nothing definite can be said about the effect of the addition of nitrogen as there was no treatment nitrogen-phosphorus.

There remains the possibility that in spite of randomisation of plots an odd chance has decreed that the control plots are all inherently poor. This may be treated by examining preliminary yields taken in 1930, which give (control = 100).

	Estate A	*Estate B*	*Serdang*
NPK ...	84	137	87
PK ...	65	139	112
P ...	84	105	104
Control ...	100	100	100

It must be realised that for the first half of 1930 treatments are fictitious. From this it appears that the controls were not conspicuously poor and that in fact the actual increase brought about by manuring was greater in the case of Estate A than appears to be the case, taking one year's results only.

Applying a method known as that of co-variance to the yields of all plots for the two years, 1930 and 1931, it is found for Estate A that the true effect of treatments, when account is taken of the inherent capacities of plots, can be better expressed by

NPK	...	228
PK	...	203
P	...	239
Control	...	100

While it is not claimed that this statistical manipulation gives exact results, it is possible to say with some certainty that the increases found are real, and, in the case of Estate A, actually underestimate true increases.

Financial.

Taking the conventional factors of a yield of 60 per cent. clean fruit from bunches and 25 per cent. oil recovery from clean fruit, it is found that the increases due to phosphate manuring, assuming 55 trees per acre and oil at £20 per ton, are Estate A £4. 9s. per acre and Estate B £7 per acre.

This has been secured by the expenditure of approximately 3 cwts. of superphosphate costing approximately £1 per acre. The actual return on Estate A has probably been considerably greater.

The soils are quartzite on Estate A and organic on Estate B and are typical of the majority of oil palms soils in Malaya. The palms at Serdang are growing

on a dark valley quartzite underlaid by a hard pan of fine sand, which is not typical.

It is probable that results at least as good, if not better, would have been attained by the use of basic slag instead of superphosphate : while it is reported from Sumatra that good results have followed the use of finely ground natural (rock) phosphate.

For 1932 basic slag instead of superphosphate has been substituted in these experiments, and a further experiment is being laid down on hill quartzite at Serdang to test natural phosphate.

Summary and Conclusions.

Financially satisfactory results have followed application of phosphate manures to 7—8 year old palms growing on hill quartzite and on organic (peaty) soils, and there appears to be no reason to suppose that good results will not follow similar applications elsewhere.

The method of application has been described in the *Malayan Agricultural Journal*, February 1932, page 111.

Addition of magnesium sulphate to phosphate mixtures gave no real increase of yield.

The liming of two plots on organic soil gave no indication of increased yield.

The addition of potash or potash and nitrogen to the phosphatic manure gave no additional increase and there is some evidence that the effect of potash was harmful.

There is no evidence from these experiments as to the effect of nitrogen without potash.

Miscellaneous Article.

MYCOLOGICAL NOTES.

BY

A. THOMPSON,

Acting Government Mycologist.

Oil Palms.

Stem-rot.—The species of *Fomes* associated with stem-rot disease of the oil palm has been found during the past year growing on almost every diseased palm examined. The fructification is usually resupinate, and appears when the disease is in an advanced stage. It has not been noticed on palms in an early stage of the disease. The fungus will shortly be named by Mr. E. Corner, Assistant Director of Gardens, Singapore.

Recent inspection of areas where preventive painting of pruned leaf bases was being tried, showed the necessity for treating the small wounds low down in leaf bases as well as treating the sloped, cut surfaces. These wounds are caused in a leaf stalk, when the leaf below it is pruned, and are frequently inconspicuous. In almost every instance, however, if the wounds are opened up it will be found that the leaf base tissue is rotted at this point, although the surface of the sloped cut may appear to be healthy. The type of rot present is more often of the non-penetrating kind, but occasionally a rot resembling stem-rot is found. Consequently, if preventive measures are being adopted, it is useless to paint the cut surface of a leaf base if the wound beneath is not treated in addition.

The fungus mould (*Thielaviopsis* sp.) is always present in wounded leaf and stem tissue. It is also invariably found in the decaying tissue of palms affected with stem-rot, along with the mycelium of the *Fomes* sp. *Thielaviopsis* is the fungus most commonly associated at first with the normal decay of leaf bases of oil palms; later on saprophytic fungi become evident, particularly *Polystictus sanguineus* — a thin orange-red fungus which is associated with a chocolate brown, rather dry type of decay. This fungus is at present considered to be harmless.

Fomes lignosus.—This fungus has already been recorded on oil palms in Malaya, and has been reported as the cause of a collar rot of oil palms in Sumatra. It is the well known parasite of rubber tree roots in this and other countries.

The fructifications vary in size from a couple of inches up to a foot in diameter. They are bracket shaped, woody and about a quarter of an inch thick. The upper surface may be red-brown, orange, or yellowish in colour. The under surface is orange or red-brown in colour and is porous. If the fructification is broken the internal tissue is found to consist of two layers; the upper layer is white and the lower layer is red-brown. This test helps to distinguish *F. lignosus* from other species.

The fungus was recently found growing on two oil palms in Selangor. The fructifications were formed on the old leaf bases at soil level, but the stem tissue had not been affected and the roots appeared normal. The leaf bases were decayed with a light brown, somewhat "corky" type of decay. The mycelium of the fungus was present in the soil near the collar and was growing on the outside of the younger, partly developed roots, but was not found in the tissue of these roots. Some of the more recently formed roots were growing through old fructifications, and were healthy.

It is as yet uncertain whether *F. lignosus* should be considered as a potential parasite of oil palms in Malaya. Inoculations have, so far, yielded no result, and cases of infection have not been under observation for a sufficient period to decide the question.

It would be helpful if any cases of this trouble were reported to this Department, before treatment is given, so that further observations can be made.

If the fructifications of the fungus are normally produced before the mycelium penetrates into the stem tissue, it should not be difficult to discover cases of infection in time to adopt control measures, and also to prevent the trouble from spreading to adjoining palms. In the case of stem-rot disease the fructifications of the *Fomes* sp. are produced, as a rule, when the affected palms are in so advanced a stage of attack that treatment is impracticable.

Tobacco.

Diseases of locally grown tobacco are being investigated.

A leaf disease caused by the fungus *Cercospora nicotianae* is prevalent. The disease is known as "Frog eye" leaf spot, in tobacco growing countries, and tends to reduce the market value of the crop.

"Slime disease" caused by a soil organism (*Bacillus solanacearum*) is also in evidence, on land where several crops of tobacco have been grown without rotation. Plants affected with this disease wilt rather suddenly, and do not recover. On splitting the stem of such plants down to the tap-root a blackish discoloration of the vascular system is exposed and if the stem is cut horizontally the vascular ring is found to be discoloured brownish-black and in a few moments cloudy, yellowish-white sap exudes from the cut surface.

It is reported that the disease is difficult to control if crop rotation, extending over a period of five years, is not practised. The organism is capable of attacking many cultivated plants and weeds, so that the range of rotation crops is limited.

Attempts to control slime disease with soil fungicides have not been very successful up to the present.

Coffee.

A small outbreak of twig die-back occurred recently. The fungus associated with the trouble was *Gloesporium coffeanum*, a known parasite of coffee leaves, stems and berries. The affected plants recovered without treatment.

A white fungus is often found growing on coffee leaves along with *Hemileia vastatrix* in the same pustules. Pure cultures of this fungus were obtained recently and the fungus was identified, by the Imperial Mycological Institute, as a species of *Myrothecium* probably *M. advena* Sacc.

It is interesting to note that this species was described, in 1908, as occurring on leaves of *Coffea Arabica* in a hothouse at Cherbourg, France.

Tea.

Interesting specimens of Collar-rot of tea seedlings were received. The plants were about eight inches in height, and had begun to die back from the top. It was found that the stems of some of the plants were blackened and the stem sunken in, for about half an inch at soil level. In other plants the stem was ringed at this point exposing the wood. The stem above the ringed portion was swollen and a callus had formed at the edge. Another smaller callus was formed at the edge of the bark below the ring.

This disease has been recorded in Java and India and Ceylon, and has been attributed to overheating of the soil by the sun, followed by excessive humidity and fungus attack, and also to mechanical injury of the stem by soil particles dashed against it during heavy rain.

Abstract.

A NEW METHOD OF PINEAPPLE PROPAGATION.*

The following method of pineapple propagation was worked out by the writer during the latter half of 1929, and up to the present has given excellent results. It promises to supersede the standard method of de-suckering lateral growths for making new material, as it produces a larger number of uniform plants of a given variety within a short time.

The pineapple plant, preferably before the formation of the fruit stem, is stripped of all leaves except the last six or so which form the rosulate young shoot. The rhizome and aerial stem, when freed from roots and scales, is then cut with a sharp knife into clean cross-sections not more than one-fifth inch thick. Such sections, which will carry from three to four, more or less dormant, buds, should be put into a two to five per cent. solution of potassium permanganate for about ten minutes, after which they should be removed and allowed to drain. They are then planted in a flat position on a prepared bed of light soil, or, if a solar frame is available, on a bed composed of chopped coconut fibre and granulated charcoal, covered with a thin layer of soil or fibre, and watered.

Germination of the dormant buds takes place within a week or a fortnight, according to the bed temperature maintained and the pineapple variety. When the buds have formed shoots, the section is lifted (care being taken to retain any embryo root system) and is severed in three triangular portions, each with its own bud. The sections are then re-dipped in the permanganate solution, re-planted in the germinal bed, and watered with a solution of ammonium sulphate. Within a short time the embryo pineapple plants with a good root system, can be transferred to an outside bed or further advanced in the green house in manured beds. Only moderate watering is necessary, but free use should be made of fibrous material (chopped coir) and dressing of cotton-seed meal or similar complete manures. The stem end may also be dipped in permanganate solution and embedded in the chopped fibre, where it roots readily. The permanganate solution is used to prevent the growth of destructive organisms.

The object of using unfruited stems is to take full advantage of the food reserves present, of which each bud is allotted a share in sectioning. Furthermore, the buds being stimulated by moist heat and by flooding with the nutrient solution, can develop a root system before decay sets in. Subsequently, the triangulate scrap of stem is almost completely re-absorbed, leaving behind only the fibrous remains of the vascular bundles intimate with the root system. It should be observed that water and gaseous exchange takes place only with difficulty through a cork membrane, thus the passage of these substances must

* Portion of an article entitled Plant Propagation, by E. A. Walters, F.R.H.S., F.R.M.S. in *Tropical Agriculture*. Vol. IX, No. 2, February 1932

occur mainly through the cortex at the cut ends of the sections, and care should be taken not to bruise these areas when cutting sections for germination.

The development of flower heads in maturing pineapple plants required for propagation may be prevented by a drop of weak sulphuric acid tubed into the centre of the expanding bud.

Subsequent Treatment of Young Plants.

From mature stems of one foot in length, from 80 to 100 plants may be obtained within six months, ready for setting out in nursery beds. Diligent manuring may be practised with the young plants, which respond vigorously to dressings of cotton-seed meal. It is not expected that such plants will behave any differently from the side-shoots and suckers tardily developed in the normal flowering and fruiting plant, or that they will not carry satisfactory fruit characters. Also, in view of the fact that the young buds are isolated from the parent before the pre-fruiting period of dormancy sets in, they should develop into fruit plants equal to, or better than, the parents forms. This is suggested by the behaviour of injured main stems, unable to fruit, but which develop a crowd of suckers each endeavouring to fruit but failing to do so owing to starvation. Most rhizome-bearing plants would appear able to reproduce themselves when treated in this manner: ginger, for instance, produces large numbers of plantlets when buds are isolated and suitably manured. In propagation work of this kind, the main object is to induce the plant or re-direct its energy wholly to the continuous production of meristematic tissue.

As seen very clearly in the Java water-sucker method of cane variety propagation, a normal single-bud shoot or cutting can be made to produce many buds by checking the formation of leading shoots as fast as these develop. This is done by lifting, dividing and replanting the bud-bearing cutting, with the leafy shoots pruned back and covered flat in the propagating bed. This is far quicker than waiting for mature cane cuttings whereon the single bud has become dormant and slow to respond. By this method, important and scarce varieties may be rapidly propagated from one introduced cutting, while the danger of importing large numbers of possibly diseased cuttings is avoided. The writer introduced one cutting of P.O.J. 2878 late in 1928, and this variety is now established at three sugar factories and is still available in quantity. Probably about 500,000 effective plants could now be obtained if all stools were divided and re-planted. This method can be successfully practised on the sugar estates.

Reviews.

The Coconut.

BY

EDWARD BINGHAM COPELAND.

Third Edition — 1931 — MacMillan & Company. London.

The third edition of this book forms a comprehensive compilation of useful facts concerning the coconut palm, derived from many years of scientific observations in the Philippine Islands and aims at providing information of practical utility for the planter in a readable and concise form.

This aim has been fully achieved. On the grounds of doubtful practical utility, chapters on statistics, capital costs and financial returns in the Philippine Islands have been omitted, though they would have been of interest to planters in other countries. In the opening chapter the physiology of the coconut is indicated in concise and simple language by reference to the general structure of the root and leaf based on many observations by the author and a multitude of students over a period of 27 years. The vital factors affecting the crop are enumerated and discussed and particular stress is laid on the value of sunshine in the economy of the palm, and on the physical condition of the soil in relation to the importance of movement of soil water. The history, distribution, symptoms and remedies of the known pests and diseases are discussed at length, special emphases being laid on bud rot, the rhinoceros beetle and the red weevil as the most important maladies in coconut cultivation. In the chapter on seed selection, the fruits of the chief varieties found in the Philippine Islands are briefly described and compared with similar varieties elsewhere and sound general rules for the selection of seed nuts are adumbrated.

The planting of dwarf types for copra production is deprecated on the grounds of economy in collection and manufacture though no differentiation is made between the different types of dwarf in this respect and though crops from dwarfs are quoted as being in excess of those from ordinary tall types. In an interesting chapter on field culture, the author favours triangular planting so as to make full use of the land, provided that 8 metres is regarded as the minimum distance between palms, though wider than this is generally advisable. He recommends supplying all vacancies which occur in the first 10 years after the original planting with supply palms approximately equal in development to the average of the stand and though this procedure is hardly practicable for palms 10 years old, the principle of filling vacancies with advanced seedlings 3—4 years old, if given special nursery treatment as regards spacing and depth of soil, might usefully be adopted. Catch crops are not favoured, except where they are a necessity and in this case the author considers that tapioca, for starch and alcohol production, is the best economically. In young groves he thinks that cultivation should be limited to small circles surrounding each palm and to

the destruction of any plants likely to overshade the coconuts; the suppression of 'lalang' is only mentioned in connection with covercrops.

In adult plantations the author rightly maintains that good field practice must vary according to local soil and climatic conditions and according to fluctuations of copra prices and labour wages. The meagreness of reliable data regarding manurial effects is stressed and it is contended that manures are of little use unless the cultural treatment is such as to secure the complete utilization of the fertilizers applied. He believes that nitrogen is best applied in the form of green manures, but wisely advises experimentation on a small scale before any manurial programme is adopted. As regards harvesting the crop the author maintains that nuts should be permitted to ripen fully on the palm until they fall—a practice which has obvious disadvantages on large estates but which would certainly improve the quality of the copra from small holdings.

With reference to the manufacture of copra it is soundly indicated that the best copra can only be produced from fully ripe nuts dried uninterruptedly from the time the nuts are opened until desiccation is complete. The loss of oil due to the presence of black and yellow moulds resulting from insufficient drying of copra is pointed out and several forms of driers in general use in the Philippines are described, but this section is disappointing in comparison with practice on local European managed estates though it justly portrays conditions on small holdings. There is an interesting chapter on the minor products of the palm in which the dwarf palm is recomended as a source for toddy though in this country tappers prefer the tall palms since they produce more liquid per tapping. The book is couched in plain straight-forward language, eminently readable and should be a welcome addition to every planter's book shelf.

H. W. J.

Departmental.

FROM THE DISTRICTS.

The Weather.

Weather conditions varied considerably in different parts of the country during the month. On the western side from Province Wellesley to Malacca, conditions were fairly dry, except for frequent and heavy showers in the country adjoining the main range in Perak and Selangor, with lighter showers in Kedah and the inland Districts of Kelantan and Negri Sembilan. On the eastern side, the plain of Kelantan was dry, while in Pahang showers fell in the second half of the month. In Johore the rainfall varied considerably, being high in places and fairly normal in others, while in Singapore it was well above the average for the month.

Remarks on Crops.

Rubber.—Prices for small-holders' rubber showed little change as compared with those of April, ranging in dollars per picul from 4 to 7.50 for smoked sheet, 3 to 6.25 for unsmoked sheet and 1 to 3.50 for scrap and lump.

The area of untapped small holdings again showed an increase, more especially in places where alternative occupations such as fishing, opening up new land for padi, fruit hawking, or even wood cutting were available. This increase in the number of untapped holdings was most noticeable in Province Wellesley, the Dindings and in the coastal Districts of Selangor. Where tapping was continued it was done on the share system, left to the women and children, or in Perak South was carried out before dawn, so that the men of the family were free to supplement their resources by other work.

Further instances of the cutting out of rubber were noted, especially where the trees were old or unprofitable. This was done to make room for planting food crops and fruit, or in mixed plantations to encourage the growth and yield of fruit trees and coconut palms. In Penang Island reduction of assessment was a further inducement. The trees removed were often sold for firewood at $1 to $2 a cart-load.

Padi.—The padi harvest was completed in Kedah where preliminary figures indicate that the crop was the heaviest on record, surpassing even the good crop of the previous season. In Kuantan District of Pahang the harvest was also completed and yields from an extended area were encouraging.

Work on the preparation of the land for the coming season's crop was commenced in north Kedah, in Krian and the central and southern Districts of Perak. In Province Wellesley work commenced was stopped by draught and in Malacca the prolonged draught delayed operations until the end of the month. In Selangor the inter-season crop was transplanted from the nurseries and in other States the fields were in various stages of preparation or transplanting was in progress.

The army worm, *Spodoptera mauritia,* damaged nurseries in Temerloh District, but spare seedlings from the Padi Test Plot were supplied to enable the owners to transplant without loss of time.

In Province Wellesley and central Perak a definite tendency to plant vegetables, where possible, on padi land in fallow was observed.

The indications are that almost everywhere the area planted with padi in the coming season will be considerably extended, both by the utilisation of all padi land formerly uncultivated and by the addition of new areas suitable for this crop.

Distribution of seed of pure strains has taken place to a moderate extent in all States. From Malacca about 3,000 gantangs of Radin Siak were sent to Pekan to replace the nurseries destroyed by the March flood, while 1,161 gantangs of four local pure strains were supplied at 8 cents per gantang, or in exchange for local padi, to Malacca growers for seed purposes.

There has been little change in local padi prices which have ranged between 6 and 8 cents a gantang in the larger padi areas and 7 to 15 cents elsewhere.

Coconuts.—Yields of nuts, which had been low in most districts, improved. In Selangor especially, but also in Penang Island, southern Perak and Johore, the number of Malays who themselves prepare copra is increasing steadily. For this purpose use is being made of the cheap type of efficient kiln recommended by the Department of Agriculture; small groups of Malays work together to supply the nuts and to produce a better quality of copra. This development has been encouraged in parts of Selangor by the enhanced price offered by certain buyers for the better quality product. In the Kukup District of Johore the Malays are not only working together to prepare their copra, but are shipping it direct to Singapore where they obtain a better price than that offered locally.

Increased interest in this cultivation and better care of holdings were recorded. In Selangor and Johore dry padi is extensively grown as a catch crop with immature coconuts, while in Province Wellesley some coconut holdings were interplanted with tapioca, sweet potatoes and chillies.

The local prices of copra have remained fairly steady.

Tobacco.—Interest in this crop is well maintained, although in some areas increased production is causing a fall in price. Good plots of tobacco have been observed in Kelantan, especially on the coastal sandy soils. The planted area in Kedah has been extended and additional shops have been opened for the manufacture of cigars and tobacco. The decline in the planted area in Province Wellesley continued and may be attributed to low prices, difficulty in finding buyers and damage by the stem boring caterpillar. In Perak South, Selangor and western Pahang, weekly fairs provide a useful market for the tobacco prepared by Malays.

Pineapples.—Large supplies of fruit were received at all factories during the month with a consequent drop in prices which, however, are better than those paid during the corresponding period of last year.

Fruit.—In Province Wellesley the first durians ripened. Large quantities

of mangoes were being imported into Penang from Siam and India and were cheaper than locally grown fruit. The mango season in Malacca terminated. On the finer coastal sand of Kelantan the pomegranate grows and fruits successfully; fruits which ripened during the month were sold locally for 20 — 25 cents each.

Mushrooms.—A Chinese in Penang Island is successfully cultivating mushrooms. They are sold for 30 cents per kati fresh and $2.00 per kati dried.

Pigs.—The pure bred pigs sent to Sungei Buloh, Selangor, from the Government Experimental Plantation, Serdang, in 1930 have been very successful in that locality and there is a big demand for their off-spring. The cross between the local sow and the pure bred boar is stated to be a hardier and more quickly maturing animal than the pure bred pig. The Middle White is preferred to the Large Black breed owing to its colour. A number of pig breeders in this area have now dispensed with all their local pigs and have substituted crossbred animals.

Rat Control in Padi Fields.

Organised hunts were continued on Glugor Estate, Penang, but attempts to persuade Malay padi landowners to follow this example were not very successful. In the Province distribution of poison baits was continued. In Krian work on the usual lines was successfully maintained; in addition a lecture tour in conjunction with the Medical and Health Department was undertaken. At each centre a short talk on padi management by an officer of the Department of Agriculture was followed by a lecture on rats delivered by a member of the Medical and Health Department. The importance of this pest in relation to health and agriculture was stressed and control measures were demonstrated by the rat destruction officers. Fifteen centres were visited and the attendance was satisfactory. In Malacca rewards were paid for 73,268 tails at the rate of four tails for one cent.

Agricultural Stations and Padi Test Plots.

Kelantan. *Kota Bahru Padi Experiment Station.*—At this new station water supplied by an electric motor and pump enabled ploughing to be commenced at a time when the land would otherwise have been too hard. Trials made at the Station showed that the local plough was superior to an imported single-handled plough designed to meet Eastern requirements. Seed of nine locally popular varieties of dry padi was collected for planting.

Province Wellesley and Penang. *Bukit Merah Padi Test Station.*—The area of $\frac{3}{4}$ acre, devoted to demonstrating the possibility of growing other short-season crops in the interval between padi crops, was planted with six varieties of vegetables. Local Malays were evincing an interest in this demonstration.

The planting of the various crops at the newer Agricultural Stations has

progressed well, while on Padi Stations and Test Plots work has been undertaken in accordance with the normal planting programme of the area in which each is situated, except that at the Glugor Station in Penang and the Kajang Test Plot in Selangor inter-season crops of padi have been planted and are growing satisfactorily.

Weekly Fairs.

Weekly village fairs, which have proved successful in several parts of the Federated Malay States, have recently been organised at ten convenient centres in Kedah by a Committee of which the Assistant Principal Agricultural Officer is Chairman. Fairs at two other centres are being arranged. Their object is to provide opportunities for the Malays to sell at reasonable prices, or to barter, their rice, vegetables, meat, fish, poultry, fruit, tobacco or other produce and thus to encourage and extend the planting of foodstuffs and fruit and the rearing of animals and poultry. A similar fair has recently been started in Kampong Bahru, Kuala Lumpur. These fairs can materially assist in adjusting supply and demand in different parts of the country. As an illustration of this point it may be mentioned that lorry loads of coconuts grown outside the State are sold at some of the fairs in the Kuala Pilah District of Negri Sembilan, while tobacco produced by Malays and Javanese in distant parts of Selangor found a ready market at the first and second fairs in Kampong Bahru, Kuala Lumpur.

DEPARTMENTAL NOTES.

Visits of the Director of Agriculture.

The Director addressed the Kuala Lumpur Rotary Club on rice cultivation in Italy on April 29th.

On May 1st and 2nd he inspected the Dairy Farm at Fraser's Hill.

On May 5th he attended a meeting of the planters at Sungkai which was addressed by Col. Eaton. At this meeting a rubber film was exhibited. The Director also addressed the meeting on the subject of work on new uses for rubber in the F.M.S.

On May 6th the Director inspected the area affected by the rubber pests on Narborough Estate in company with the Visiting Agent and Manager. On the same day he proceeded to Kuala Kangsar and there inspected the Agricultural Station, the Padi Experiment Station at Talang and subsequently proceeded to Kenas and walked over the irrigation area with the Senior Agricultural Officer, Perak.

On May 7th, after an interview with the District Officer, Kuala Kangsar, he inspected with the Senior Agricultural Officer, the padi experimental plots at Bukit Gantang and then proceeded to Taiping where he inspected the Kamunting Experiment Station and dealt with other matters. In the afternoon he proceeded to Selama and inspected the new Agricultural Station. After leaving Selama he proceeded to Krian and inspected sites for the proposed test plots in the Krian area. He returned to Kuala Lumpur from Taiping by the night mail.

On Friday May 29th, the Director proceeded to Singapore to attend a meeting. He returned to Kuala Lumpur on the following day, and in the afternoon proceeded to Teluk Anson where he attended a meeting of the coconut planters on Sunday in conjunction with Mr. F. C. Cooke as a preliminary to the latter's tour in the Bagan Datoh District. The meeting was addressed by Mr. Cooke and the Director on the subject of copra research work.

Demonstrations to Chinese.

The value of demonstrations to Chinese agriculturists was strikingly illustrated as a result of the application by a number of Chinese in the Bukit Kapar Chinese area in Selangor for permission to continue the inter-planting of rubber in their coffee plantations, as they stated that the soil was unsuitable for coffee cultivation.

Inspection of the area shewed that the coffee had been severely attacked by leaf-eating caterpillars in 1930 and as a result of excessive soil wash and poor cultivation, many of the trees had failed to recover.

Methods of soil conservation were explained to the headmen by the Chinese Sub-Inspector of Agriculture, but they stated that they were too expensive, of little use and that they still wished to plant rubber, as it was the only crop which paid.

In consequence of this unwillingness to carry out necessary cultural operations, a party of seven of the Chinese headmen visited the Government Experimental Plantation, Serdang, and the Chinese Tea Area at Sungei Balak on April 30th, to inspect the cultivation of crops and the methods of soil conservation. The party was particularly impressed by the tea area at Sungei Balak, the Chinese headman of which enthusiastically explained to them tea cultivation and especially the benefits to his own crops which followed the introduction of silt pits and cover crops.

The party was then taken to the Cheras Experimental Station, where they saw further methods of soil cultivation and a number of crops.

The headmen finally agreed to call a meeting of their friends at which they would advise the cutting out of the interplanted rubber and the further planting of coffee, tobacco and other crops together with the introduction of silt pits and cover crops.

Lectures in Lower Perak.

During the period, May 22nd to May 28th, the Assistant Chemist for Copra Research visited twenty coconut estates in the Bagan Datoh district of Lower Perak and certain native small-holdings at Sabak Bernam. The object of the visits was to indicate faults in manufacturing methods and in kiln design and to make suggestions which would lead to the export of an improved grade of copra from this District. It may safely be claimed that these suggestions involve no increase in the actual cost of manufacture though a number of alterations to existing kilns are essential.

On 22nd May an address was given to the members of the Coconut Planters' Association at the Bagan Datoh Club entitled "The Deterioration of Copra". Amongst those present was the Director of Agriculture, Straits Settlements and Federated Malay States, who contributed to the subsequent discussion which was of a most interesting and animated character.

On May 26th a further lecture was delivered to a well-attended meeting of the Association, entitled "Copra Manufacture".

School of Agriculture, Malaya.

The School of Agriculture reopened on 17th May 1932, and has thus been launched on its second year of existence. There are now 29 students in residence as against 37 at the end of the past school year, 24 students having left in April on the conclusion of their training, while 16 new students have been admitted.

Unfortunately for the school, the recruitment of Agricultural Students and Pupils in Training for the Federated Malay States and Straits Settlements Governments has had to be suspended temporarily, owing to the financial situation. Had this recruitment been possible, a further 22 students would probably have entered the school this term.

Of those now in residence, 24 are taking the Three Years Course, and 5 the One Year Course of training. 17 are Malays, 4 Chinese, and 8 Indians.

In relation to new students, two significant features are to be observed. In the first place, considerable progress has been made in the provision of scholarships, the Jaffnese Co-operative Society Ltd. having awarded four, the Victoria Institution two, and the Sarawak Government one scholarship — all tenable for the Three Years Course. In the second place, the fact that there are two boys from Brunei, one from British North Borneo and one from Sarawak is evidence that the school is appreciated beyond the Peninsula itself.

Tea Machinery at Cameron Highlands.

The installation of the machinery in the new tea factory at the Experimental Station, Cameron Highlands was completed by the F.M.S. Government Factory in April.

A trial run of the machinery was made in the presence of the Director of Agriculture on 14th April, when it was found necessary to make minor adjustments in the speeds of the machinery, which faults have now been corrected.

Statistical.

MARKET PRICES.

May, 1932.

Rubber.—The average spot price of rubber smoked sheet equal to London Standard was 5.39 cents per lb. in Singapore, 3.04 cents (gold) New York and 1.81d. London in May, as compared with 5.4 cents Singapore, 1.46 cents (gold) New York and 2.97d. London in April. The highest Singapore price recorded in May was 5¾ cents per lb. and the lowest 5 cents per lb.

Palm Oil.—The course of the market during May was as follows:—6th. £15.10.0., 13th. £14.10.0., 18th. £15.10.0., 26th. £15. These prices are c.i.f. Liverpool on a basis of 18 per cent. f.f.a. The market was reported to be steady.

Copra.—Prices have shewn a downward tendency during the month. The average price of Sundried was $5.48 per picul as compared with $5.67 in April. Mixed averaged $4.92 per picul as compared with $5.06 in the previous month.

Copra cake averaged $1.82 per picul in May.

Gambier.—Prices have been quoted between $16 and $17 per picul throughout the month for Cube No. 1, the average price being $16.62 as compared with an average of $17.50 in April. The average price of Block gambier in May was $7.69 per picul as compared with $8.37 in April.

Rice.—The following are the wholesale prices of rice per picul in Singapore in April:—Siam No. 2 ordinary $3.84, Saigon No. 1, $4.01, Rangoon No. 1 $3.89. Corresponding prices in March were $4.26, $4.24 and $4.12.

Retail prices in cents per gantang of Siam No. 2 rice in April were:—Singapore 31, Penang 38, Malacca 30 as compared with 32, 38 and 30 respectively in March.

Coffee.—Prices improved during May. The average Singapore price of Palambang coffee in May was $18.54 per picul as compared with $15.65 in April. Average prices for Sourabaya coffee were from $21.75 to $23.19, the price within these limits depending upon quality. The corresponding prices in April were from $19.95 to $21.25.

Arecanuts.—Singapore prices have sagged still further. Palambangs averaged $2.75 per picul in May as compared with $3.24 in April and Bila Whole $2.87 as compared with $3.32 for the previous month. Average May quotations for other grades were as follows:—Split $3.50 to $5.16, Red Whole $5.25 to $6.12, Slice $9.19 to $10.81, Kelantan $4.50 to $4.96, the price within each range depending upon quality.

Pineapples.—Canners have held for a minimum price at which the London market is only buying sparingly. Quotations for May have therefore been steady at $3.50 per case for 1½ lb. cubes, $3.30 per case for ½ lb. sliced flat, and $3.50 per case for 1½ lb. sliced tall. Corresponding average prices for April

were $3.47½, $3.30, and $3.52½.

Tapioca.—Flake fair has improved slightly, the closing price being $3.25 per picul, while the average for May was $2.75 as compared with $2.81 in April. Pearl seed has been steady throughout the month at $3.80 as compared with an average in April of $3.85, while Pearl medium has been quoted throughout May at $4.25 as compared with $4.21 in April.

Sago.—Prices for Pearl, small fair, have been steady at $4.25 per picul as compared with $4.17½ in April. Flour, Sarawak fair, averaged $2.04 per picul the demand having fallen off during the month. The average price of this grade in April was $2.17½ per picul.

Nutmegs and Mace.—Prices nominally shew little change, but sellers are reported to be keen to secure business. Average price of nutmegs in May were :—110 per lb. $24 per picul as compared with $25.37½ in April; 80 per lb. $27.25 as compared with $28.87½ in April. Mace prices throughout the month were quoted as follows :—Siouw $61 per picul, Amboina $44 per picul as compared with $68.75 and $45 per picul respectively in the previous month.

Pepper.—Demand has been small and prices have eased somewhat. Average prices per picul for May were :—Singapore black $18.56, Singapore white $22.25, Muntok white $22.75. Corresponding prices in April were $20.25, $24.25, and $24.75.

Cloves.—Nominal prices quoted remain unchanged at $47 per picul for Zanzibar and $50 for Amboina.

The above prices are based on London and Singapore quotations for rubber and on the Singapore Chamber of Commerce Weekly Reports published in May. Palm oil reports are kindly supplied by Messrs. Cumberbatch and Co., Ltd., Kuala Lumpur, and reports on the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore.

1 picul = 133⅓ lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural products. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

April, 1932.

Malaya.—Gross foreign imports of rice during April 1932 amounted to 38,275 tons as compared with 47,188 tons in April 1931 ,of which 46.6 per cent. were consigned to Singapore, 13.1 per cent. to Penang, 6.4 per cent. to Malacca, 13.1 per cent. to F.M.S. and 2.8 per cent. to the U.M.S.

Of these imports 63.8 per cent. were from Siam, 34.1 per cent. from Burma, 1.1 per cent. from French Indo-China and 1 per cent. from other countries.

Total foreign exports of rice in April 1932 were 12,821 tons (including 111 tons domestic production exported from Penang) as compared with 12,445 tons in April 1931. Of these exports 78 per cent. went to the Netherlands East Indies and 22 per cent. to other countries.

Net imports for the period January to April 1932 were 139,539 tons as compared with 175,872 tons for the same period of 1931, a fall of 20.7 per cent.

Padi reports state that the harvest is completed in the chief padi-growing districts in the Federated Malay States and in Malacca, while it is in progress in Province Wellesley and Kedah. Crops generally are stated to be good.

India.—Total foreign exports of rice (*Indian Trade Journal* 28.4.32) during February 1932 were 241,000 tons as compared with 168,000 tons in January 1932 and 146,000 tons in February 1931, increases of 43.5 per cent. in respect of the previous month and 65.1 per cent. in respect of the same period of the previous year.

Total exports of rice and bran from Burma for the period January 1 to March 26, 1932, amounted to 1,004,397 tons as compared with 902,707 tons for the same period of the previous year or an increase of 11.3 per cent.

Of the above exports 255,996 tons went to India in 1932 as compared with 382,562 tons in 1931, a decrease of 33.1 per cent.

Siam.—Exports of rice from Bangkok during March 1932 amounted to 155,689 tons (approximate) as compared with 121,931 tons in March, or an increase of 27.7 per cent.

Exports of rice from Bangkok during the period December 1931 to March 1932 amounted to 495,886 tons an increase of 88,673 tons or 21.8 per cent. as compared with the same period of 1930—1931.

Netherlands India.—Java and Madura. The *Korte Berichten* states that at the end of March 1932 the area harvested amounted to 1,288,000 acres, an increase of 169,750 acres or 15.2 per cent. as compared with the same period of 1931, the area damaged to 37,145 acres a decrease of 9,419 acres or 20.2 per cent. as compared with 1931, and additional plantings awaiting harvest to 6,742,750 acres an increase of 1,750 acres as compared with 1931, a total of 8,067,895 acres as compared with 7,905,810 acres for the same period of 1931, an increase of 2 per cent.

* The following is abridged from the Rice Summary for April 1932, compiled by the Department of Statistics, S.S. and F.M.S.

Imports of rice into Java and Madura during the first quarter of 1932 were 77,779 tons as compared with 100,059 tons for the same period of 1931 or a fall of 22.3 per cent.

French Indo-China.—Entries of padi at the port of Cholon from 1.1.32 to 30.4.32 amounted to 445,412 (metric) tons, an increase of 64,677 tons or 17 per cent. as compared with the same period of 1931.

Exports of rice from Saigon for the period 1.1.32 to 30.4.32 amounted to 410,199 (metric) tons an increase of 88,431 tons or 27.5 per cent. as compared with the same period of 1931.

The *International Crop Report*, Rome, for March 1932 states that the crop of the tenth month (1,203,400 tons of rough rice) in Tonkin was below expectations being 91.8 per cent. of last year's especially large crop and 19.3 per cent. above the average of the five years ending 1929—30. Though production data for the crop of the second semester in Annam and for the crop of Cochin China, and Cambodia, which together make up over half the total for Indo-China, are lacking, it may be stated from the general information available that the total crop of Indo-China will be 200,000 tons to 290,000 tons below that of the preceding season and 400,000 tons to 490,000 tons below the five year average; this year's crop will thus be one of the smallest in the last decade.

The padi market in April (Official Report) was firm at the beginning of the fortnight, became slightly easier and closed on a quiet note. Cholon possessed fairly large stocks of padi and farmers living in the provinces were chary of putting their stocks on the market.

In the rice market (Official Report) Japan made enquiries during the first half of April and when this ceased the market weakened as neither Hongkong, Shanghai nor Java evinced any interest. France bought some small parcels.

The Brokens market (Official Report) during April was very quiet though India purchased a few small lots. In spite of the poor demand the market remained very firm.

Europe and America.—Quantities of rice shipped from the East were :—

(*a*) To Europe, period January 1 to April 14, 1932, 265,401 tons as compared with 204,718 tons for the same period of 1931, or an increase of 29.6 per cent.

Of the 1932 shipments 64.5 per cent. was from Burma, Nil from Japan, 27.5 per cent. from Saigon, 2.2 per cent. from Siam and 5.8 per cent. from Bengal as compared with 61.4 per cent. from Burma, 4.6 per cent. from Japan, 20.0 per cent. from Saigon, 8.5 per cent. from Siam and 5.5 per cent. from Bengal in 1931.

(*b*) To the Levant, period January 1 to March 10, 1932, 22,361 tons, an increase of 14,109 tons or 171 per cent. as compared with the same period of 1931.

(*c*) To the West Indies and America, period January to March 8, 1932, 32,670 tons, a decrease of 4,758 tons or 12.7 per cent. as compared with the same period of 1931.

MALAYAN AGRICULTURAL EXPORTS, MARCH, 1932.

PRODUCT.	NET EXPORTS IN TONS.				
	Year 1931	Jan.—Mar. 1931	Jan.—Mar. 1932	March 1931	March 1932
Arecanuts ...	19,266	5,522	7,108	1,649	2,668
Coconuts, Fresh ...	10,468	1,685	22,977*	478	9,760*
Coconut oil ...	9,909	2,361	2,642	920	931
Copra ...	100,809	19,975	18,643	5,768	5,590
Gambier all kinds ...	2,563	595	829	212	326
Palm kernels ...	726	117	265	60	95
Palm oil ...	4,574	803	1,444	295	623
Pineapple, canned ...	59,457	13,077	16,374	3,039	4,438
Sago — flour ...	5,608	478	3,762	1,054	734
Sago — pearl ...	2,429	340	642	147	191
Sago — raw ...	2,904†	1,009†	1,049†	313†	471†
Tapioca — flake ...	9,742	2,825	2,178	1,115	852
Tapioca — flour ...	491†	178	95†	169	78†
Tapioca — pearl ...	19,006	4,052	4,672	1,555	2,076
Tuba roots ...	74	15	30	5	28

*'000 in number. † Net imports.

Correction.

Area of land in Malaya planted with rubber at end of 1931.

Reference the table on page 247 of May 1932 number of this Journal, the figures for Johore should read as follows:—

	Estates of 100 acres and over.			Estates under 100 acres Total	Total area planted
	Tappable.	Immature.	Total.		
	Acres.	Acres.	Acres.	Acres.	Acres.
Johore ...	313,385	145,757	459,142	341,613	800,755.

ACREAGE OF TAPPABLE RUBBER OUT OF TAPPING ON ESTATES OF 100 ACRES AND OVER, MALAYA, AT END OF MARCH, 1932.

State or Territory	Acreage of Tappable Rubber end 1931	Estates which have entirely ceased tapping		Estates which have partly ceased tapping		Total (3) + (5)	Percentage of (7) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Perak	238,420	7,808	3.3	28,391	11.9	36,199	15.1
Selangor	294,030	13,174	4.5	36,777	12.5	49,951	17.0
Negri Sembilan	217,002	12,129	5.6	26,404	12.2	38,533	17.7
Pahang	35,122	3,004	8.5	4,474	12.7	7,478	21.3
Total F.M.S. ...	784,574	36,115	4.6	96,046	12.2	132,161	16.8
Malacca	110,288	4,405	4.0	19,345	17.5	23,750	21.5
Province Wellesley	44,055	4,044	9.2	8,669	19.7	12,713	28.9
Dindings	6,700	431	6.4	1,077	16.0	1,508	22.5
Penang Island	1,585	1,058	66.7	84	5.3	1,142	72.0
Singapore Island	28,033	9,553	34.0	5,942	21.2	15,495	55.3
Total S.S. ...	190,661	19,491	10.2	35,117	18.4	54,608	28.6
Johore	313,385	28,677	9.2	40,767	13.0	69,444	22.2
Kedah (*a*)	102,220	5,209	5.1	9,161	9.0	14,370	14.1
Kelantan	16,785	6,742	40.2	796	4.7	7,538	44.9
Trengganu (*b*)	4,300	Nil	Nil	Nil	Nil	Nil	Nil
Perlis	624	308	49.4	156	25.0	464	74.4
Total U.M.S. ...	437,314	40,936	9.4	50,880	11.7	91,816	21.0
Total Malaya ...	1,412,549	96,542	6.8	182,043	12.9	278,585	19.7

Notes:—1. (*a*) Registered companies only and are rendered quarterly, commencing with June 1931.

(*b*) Registered Companies only.

2. Areas rested due to rotational system end March (not included above): Acres F.M.S. 46,731, S.S. 15,587, U.M.S. 50,331 or 8 per cent. of tappable area (col. 2). Compiled from statistics prepared by the Statistics Dept. S.S. & F.M.S.

MALAYA RUBBER STATISTICS

TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF APRIL, 1932 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month		
								during the month		during the year 1932		during the month		during the year 1932				
	Ports	Dealers	Estates of 100 acres and over	during the month	during the year 1932	during the month	during the year 1932	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
MALAY STATES :—																		
Federated Malay States	...	19,432	12,524	11,132	47,123	6,154	30,077	Nil	Nil	Nil	Nil	11,868	5,848	51,155	24,682	...	18,695	12,812
Johore	...	2,437	3,561	3,561	14,672	3,048	13,645	Nil	4	Nil	18	883	5,725	3,711	24,480	...	2,537	3,430
Kedah	...	429	2,202	2,146	8,940	560	3,439	Nil	Nil	Nil	Nil	590	2,153	2,500	9,892	...	504	2,090
Perlis	...	33	11	7	26	2	35	Nil	Nil	Nil	Nil	Nil	7	Nil	49	...	36	10
Kelantan ...	...	112	124	119	509	12	1,065	12	Nil	84	Nil	47	176	193	1,521	...	49	107
Trengganu ...	...	55	50	101	385	51	192	Nil	Nil	Nil	Nil	Nil	152	Nil	577		55	50
Total Malay States	...	22,498	18,472	17,066	17,655	9,827	48,453	12	4	84	18	13,388	14,061	57,559	61,201	...	21,912	18,499
STRAITS SETTLEMENTS																		
Malacca ...	...	4,565	1,335	1,252	5,384			Nil		Nil		3,498		15,254		...	4,433	1,332
Province Wellesley	...	78	704	421	1,553	(2)	(2)	Nil		Nil						...	86	562
Dindings ...	...	275	89	88	390	1,769	7,543	Nil	14,066	Nil	61,295	4,981	Nil	22,753	Nil	...	281	87
Penang	1,150	4,600	11	1	12			263		2,334						1,179	3,946	11
Singapore ...	2,365	38,039	220	140	636			3,429		21,178		14,803		65,653		3,055	35,323	239
Total Straits Settlements	3,515	47,557	2,359	1,902	7,975	1,769	7,543	3,692	14,066	23,512	61,295	23,282	Nil	103,660	Nil	4,234	44,069	2,231
TOTAL MALAYA	3,515	70,055	20,831	18,968	79,630	11,569	55,996	3,704	14,070	23,596	61,313	36,670	14,061	161,219	61,201	42.34	65,981	20,730

TABLE II

DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Total
20	21	22	23	24	25	26
DRY RUBBER	16,119	32,689	3,627	4,601	1,158	58,194
WET RUBBER	2,576	2,634	319	199	1,415	7,143
TOTAL ...	18,695	35,323	3,946	4,800	2,573	65,337

TABLE III

FOREIGN EXPORTS

PORTS	For month	during the year 1932
Singapore ...	23,773	98,598
Penang ...	8,290	37,881
Port Swettenham.	4,453	21,017
Malacca ...	154	3,723
MALAYA ...	36,670	161,219

TABLE IV

DOMESTIC EXPORTS 4

AREA	For month	during the year 1932
Malay States ... / Straits Settlements	32,161	135,244
MALAYA ...	32,161	135,244

Notes :—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [19A] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements, Columns [7] and [8] represent purchases by dealers from local estates of less than 100 acres, reduced by 15% to terms of dry rubber.

3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25%; scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.

4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.

5. The above, with certain omissions, is the Report published by W. R. Boyd, M. C. S., Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23rd April, 1932.

METEOROLOGICAL SUMMARY, MALAYA, APRIL, 1932.

Locality	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine		
	Means of		Mean of A and B	Absolute Extremes				At 1 foot	At 4 feet	Total		Most in a day	Number of days					Total	Daily Mean	Per cent
	A. Max.	B. Min.		Highest Max.	Lowest Min.	Lowest Max.	Highest Min.					Amt.	Precipitation .01 in or more	Precipitation, .05 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hr.	hr.	%
Railway Hill, Kuala Lumpur, Selangor ...	91.4	72.6	82.0	95	70	84	75	84.7	84.8	8.46	214.9	2.59	16	14	5	3		202.90	6.76	55
Bukit Jeram, Selangor ...	88.6	73.1	80.9	92	70	84	76	84.7	86.2	6.69	169.9	1.48	15	14		1		216.90	7.23	59
Sitiawan, Perak ...	89.7	73.3	81.5	92	70	86	76	84.4	84.6	4.63	117.6	1.31	21	18	10	2		212.50	7.08	58
Kroh, Perak ...	88.1	70.3	79.2	91	66	85	73	83.2	82.7	5.64	143.3	1.33	19	15				210.25	7.01	57
Temerloh, Pahang ...	88.8	73.1	80.9	92	71	78	76	84.7	84.6	9.22	234.2	2.17	18	16	5	8		186.15	6.21	59
Kuala Lipis, Pahang ...	89.0	72.2	80.6	93	70	81	75	84.1	83.7	7.47	189.7	1.44	20	18	5	18		182.80	6.09	50
Kuala Pahang, Pahang ...	86.0	74.3	80.1	89	72	78	79	83.3	84.2	20.41	518.4	5.17	21	16	1	1		226.25	7.54	62
Mount Faber, Singapore ...	87.4	74.1	80.7	92	71	77	77	81.9	82.3	6.37	161.8	1.38	17	16	8	3		166.90	5.56	45
Butterworth, Province Wellesley ...	88.1	74.5	81.3	91	72	83	77	85.0	85.1	14.43	366.5	2.73	21	19				225.25	7.51	61
Bukit China, Malacca ...	86.3	74.0	80.1	90	71	83	76	83.8	84.0	5.20	132.1	1.74	13	11	1			210.60	7.02	57
Kluang, Johore ...	89.8	72.4	81.1	93	70	83	75	82.7	82.5	7.31	185.7	1.01	19	18	8	13		175.20	5.84	48
Bukit Lalang, Mersing, Johore	86.6	72.8	79.7	89	70	83	75	82.4	81.4	7.21	183.1	1.66	13	12		2		202.50	6.75	55
Alor Star, Kedah ...	90.5	73.9	82.2	95	69	86	77	86.5	85.9	9.10	231.1	2.66	16	13	11	2		244.30	8.14	67
Kota Bahru, Kelantan ...	89.8	73.6	81.7	92	71	86	76	84.3	83.9	1.66	42.2	0.96	9	5	1	2		257.95	8.60	70
Kuala Trengganu, Trengganu	88.8	73.3	81.1	92	71	82	75	84.1	83.9	1.60	40.7	0.63	8	7	2	1		254.80	8.49	70
HILL STATIONS.																				
Cameron Highlands, Rhodendron Hill, Pahang 5120 ft. ...	71.9	59.5	65.7	76	56	67	62			12.91	327.9	3.25	21	17		4		138.15	4.61	38
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	72.8	58.0	65.4	76	51	69	64	69.8	69.1	13.21	325.5	3.26	21	18	6	5		118.10	3.94	32
Fraser's Hill, Pahang 4268 ft.	73.1	62.9	68.0	78	60	68	65	71.6	71.5	14.05	356.9	3.22	23	21	3	19		136.60	4.55	37

Compiled from Returns supplied by the Meteorological Branch, Malaya.